PERSONAL
COMPUTER NEWS
50p January 14, 1984 No 44 BRITAIN'S BIGGEST WEEKLY

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We compare three text-printing packages

SOUPED-UP 64
Cassette-based compiler gives go-faster programs

SIX OF THE BEST?
Aliens, bombs and beasts for the Vic, 64 & Dragon

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CUT-PRICE COLOUR
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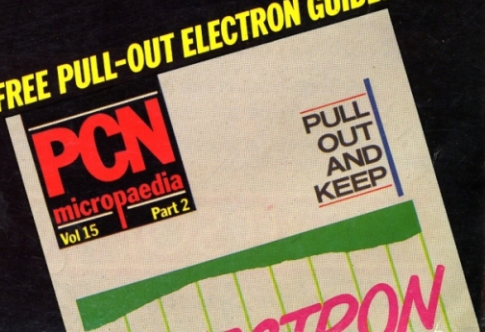

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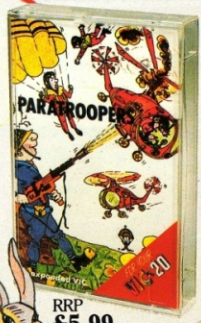

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Sinclair on cue

When it's launched next year and that date is a much less safe bet — Sinclair's new master weapon looks very much like a portable business computer armed with 16K CMOS RAM (minimum), dual Microdrives, a Liquid Crystal Display screen (a Sinclair flat-screen would be too hard to read), a full-travel keyboard, the ability to run a proper composite video monitor with 80-column screen. It will cost between £400 and £500.

On the ball — *PCN* last November

By Geof Wheelwright

Sinclair Research's long-awaited ZX83 business micro is due to be launched this week, and there's every indication that it's as *PCN* predicted two months ago.

According to a source close to Sinclair, the machine — to be known as the Sinclair QL — will use a 68000-type processor, have two Microdrives built-in, come with 128K RAM expandable to 148K, have multi-tasking facilities using Sinclair's QDOS proprietary operating system and cost £399. It is also said to have full networking and RS232 interfacing, RGB output, joystick ports, modem facility, a proper Qwerty-style typewriter keyboard, five function keys, and four cursor keys laid out on either side of the space bar like the Oric.

The machine is said to come with 'super-enhanced Sinclair Basic' and five pieces of software including a word-processor, database, and spreadsheet.

Much of this was predicted by *PCN* in Issue 36 last November. We said that the ZX83 would be '. . . a portable business computer . . . with dual Microdrives, a full-travel keyboard . . .'

PCN's prediction that Sinclair would use the CMOS RAM technology was wrong, but this machine will be competitive in both price and application to CMOS-based portable micros. The £399 price should put the machine up against the rush of £400 to £1,000, business machines expected from Japan and range it alongside the BBC Micro.

The price will also put this new machine outside the provisions of Sinclair's agreement with Timex that allow Timex the North American rights to any 'personal computers' selling for under $500. So Sinclair will be free to do whatever it wants with this machine in the often lucrative North American market without being held to its association with Timex.

Amstrad sets sights on Enterprise

British hi-fi manufacturer Amstrad is to launch a direct competitor to the Elan Enterprise in April or May this year.

Like the Enterprise, Amstrad's micro is said to have 64K of RAM and to be Z80-based, costing about £200. Its expansion capabilities should be similar to the Enterprise, which grows to 3.9Mb, and its graphics will be similar to the BBC's.

The Amstrad micro has a separate numeric pad plus built-in colour monitor and cassette deck, and three-channel, six octave sound capacity.

It comes with Centronics interface and provision for an add-on disk interface, but no RS232, whereas the Enterprise has twin cassette ports, a printer port and a serial port, the latter providing a networking facility.

Made in Japan, Amstrad's micro should sell through high street stores.

Malcolm Miller, Amstrad's marketing director, was keeping quiet about the micro. He did, however, confirm its launch time.

Meanwhile, disk drives for the Enterprise should be out at the end of August. There will be a choice of single or double 3½in Sony-type microfloppies giving up to 4Mb.

Silver Reed pushes down the daisies

Japanese printer rivalry is beginning to spread to the UK and the result could be much cheaper printing.

Silver Reed and Brother, which until recently have been fighting it out in the typewriter business, have both launched printers that bring prices to new low levels. Brother has concentrated on the portable typewriter/printer style of system (Issue 35), but Silver Reed is going for daisywheel users with a vengeance.

Its EXP 500, distributed in this country by CW/P Computers (01-828 9000), prints at a pedestrian 14 cps but its price of £299 includes VAT, a 12-month guarantee, and a parallel interface.

An RS232 interface comes for £50 extra.

You can use 10, 12 or 15 pitch daisywheels to vary the density of printing, and the unit also offers emulation to run off Wordstar and other word processing programs.

Well established in the UK as a supplier of typewriters, Silver Reed has 260 service centres around the country.

Wild West Shootout winners

Many of you rose to the challenge of our Wild West Shootout competition published in No 39. The ten winners picked at random will each receive a light rifle, made by Stack Computer Services, and three games.

These winners were among entrants who unscrambled our 11-line program to discover that members of the famous Clanton gang are buried at Boot Hill, and the mining town is Tombstone, Arizona. The lucky ten are:

Paul Kolenbrander, of Holland; Walter Clark, of Wallsend, Tyne & Wear; B Cowen, of Darwen, Lancs; AR Heinrichsons, of Wokingham, Berkshire; Laurence Steen, of Kilmessan, Co Meath, Ireland; DJ Glassey, of Freshwater, Isle of Wight; Simon Andrews, of Bishopbriggs, Glasgow; Gemma Confield, of London N22; William McAleer, of East Kilbride, Glasgow; Tony Buckenham, of Wirral.

To everybody else who entered and didn't win, *PCN* will be running more competitions at intervals through the year, so keep your eyes on future issues.

Portico seeks miracle

Portico is struggling to find a future for its Miracle portable micro.

A severe cash crisis has forced the company to try to re-structure its financial arrangements, and at the same time it has left its South London offices. But a company spokesman said that a miracle along the lines of the raising of Lazarus wouldn't be necessary — Portico wasn't dead yet.

'It isn't a simple future, but it doesn't look irredeemable at the moment,' he said. Portico is looking for a refinancing arrangement, and at the same time is moving to new premises, the spokesman added.

It has left its London SE11 premises without leaving a forwarding address which has led to rumours that it had gone out of business. The spokesman commented: 'If you leave without giving a forwarding address you immediately draw all sorts of remarks.'

He could not comment on Portico's immediate prospects but acknowledged that the company has faced a severe cash flow problem. Rade Systems, the company that supplies the Miracle's processor board, said that it had taken no new orders from Portico for over a month — previously it had averaged 30 to 40 units a month.

The Miracle was launched in autumn of last year and attracted some very complimentary reviews. Costing £1,795, it has 64K of RAM, 64K of cache memory, twin 386K floppies and a swathe of free software. *PCN* (Issue 29) said: 'The Portico Miracle may seem a little like a hopeful latecomer. But this particular Z80, CP/M plus free software in a portable box offering is a little bit special.'

Ironically *PCN*'s reviewer compared the Miracle to the Osborne, another machine with a considerable shadow over its future — but in Osborne's case this could be settled at a major meeting next week.

Portico's Miracle — at the centre of a disappearing act.

Prism lets mole out of the bag

A personal robot called Topo, the mole, is about to burrow into the UK.

Prism is expected to launch Topo here this week. The robot is built in the US by Androbot of California, a company set up by none other than Nolan Bushnell, the founder of Atari.

For the moment Topo only runs off an Apple IIe or II+ with an RS232 interface; but Androbot says that versions to interface with IBM, Commodore and Atari machines will be ready by the spring.

Driven by three 8031 microprocessors, the robot is capable of moving around, talking (in different languages), and pulling the optional Androwagon. You communicate with the robot through a two-way infra-red link in a language based on Forth; there is an option to make Logo available as the language of instruction and another to give the device complex series of commands.

In the US Topo costs $1,595 and deliveries are running between four and six weeks behind orders. Mr Bushnell, a showman of many years' experience, is offering a special edition robot with his signature engraved on a plaque to the first 500 buyers.

We'll give full details of Prism's plans for the personal robot in the UK next week.

Soft sectored

Microdisk software is starting to come through in volume as Hitachi's 3in disks catch on among BBC users.

A spokesman for Advanced Memory Systems, which sells the Hitachi drives, said the relative lack of software had held back the 3in units. But software houses are making their products available on the disks; educational software, in particular, is becoming more common.

The software houses concerned are Gemini Marketing (0395 265165) with business packages, Clares (0606 48511) with utilities including the controversial tape-to-disk routine Replica II, Bourne (0794 523301) which specialises in educational software, and BeeBug-Soft of High Wycombe.

Microfloppies — Hitachi draws software support from BBC specialists.

ZX Spectrum Interfaces on-stream

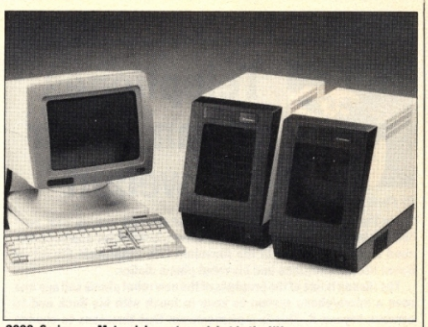
Sinclair Research reports that production and distribution of both Interfaces 1 and 2 for the Spectrum are running smoothly.

According to a Sinclair spokesman there are absolutely no problems in supplying the Interface 2 which provides a games cartridge port and joystick facilities for the Spectrum. The product has already gone into retail outlets after the usual Sinclair mail-order introduction. The more sophisticated Interface 1, however, is still a mail-order only product.

The good news is the production rate is now up to 10,000 interfaces a month. The accompanying Microdrive unit is produced at an equivalent rate — Sinclair is still specifying one Microdrive per interface.

The bad news is that nevertheless demand still outstrips supply.

The Interface 1 and Microdrive are still alotted according to the date of their Spectrum mail-order purchase. So far, Sinclair has worked through the customer list to about the middle of 1982.



2000 Series — Motorola's systems debut in the UK.

Motorola pushes out Unix boat

The Unix 68000-based operating system received two boosts this week with the launch of a new Unix machine from Motorola and the development of a Unix training scheme.

Though neither the new machine nor the greater availability of training is likely to strike fear into the hearts of MSDOS or CP/M software suppliers, Unix could well grab an increasing share of the upmarket demand for expensive specialist operating systems.

It can't expect to have much impact on the home computer scene as you really need about 5Mb of storage and a hard disk. The suggested 'configuration' of Motorola's new 2000 series machine (starting at £10,000) includes 704K of RAM and a 20Mb hard disk.

The Motorola machine is also significant because it marks the first move away from components and sub-systems by Motorola in the UK. The machine is, of course, based around the Motorola 68000 processor for which the Unix operating system was written and can be expanded to communicate with mainframes.

The new Unix training scheme, Q-Rain (from the Quantime and Instruction Set companies), will be offering courses in Unix, the C programming language, Ada and the new System V version of Unix. The courses start in February.

NEC portable in shops soon

The NEC portable PC-8201A computer's arrival in the shops is imminent.

A spokesman for NEC said the company had just received 'two jumbo-jet-fulls' and should have them in shops by the end of the month.

The CMOS RAM Tandy Model 100-lookalike portable computer sells for £475 without VAT and includes 16K RAM as standard memory. Printer cables will cost £20, and memory upgrades to a maximum of 64K internally will cost £52 per 8K — the 32K RAM pack that plugs at the side of the machine costs £190.

Included in the price of the basic machine is a cassette with 25 games and utilities programs, as well as a built-in word-processor and telecommunications package. Among the standard interfaces are parallel printer and RS-232C connections, two serial ports for planned disk drives and a connection for a bar-code reader.

The 8201A can be connected to any standard cassette recorder but NEC also offers its own data recorder for £58.

The shoot-out of the lap-held portables should now begin. Led by Epson's HX-20 the main contenders have all come under starter's orders — Tandy with its Model 100, NEC with the PC-8201A, and Olivetti with its M10.

Epson was first in the field but it was the Tandy system that heralded the new generation of portable computer, specifically with its integrated software. The NEC is basically the same machine, and in Japan it has been wiping the floor with the Tandy system. Olivetti's is the dark horse.

If a three-way challenge develops, various factors should help decide the winner. Tandy was first, NEC has a name that can be readily identified with the Japanese reputation for quality, and Olivetti will be best known to European users, particularly those in offices.

VIEW FROM AMERICA

Telephones groan under the weight

By Chris Rowley

Since I'm sure you have all had 1984-mongering way up past your keisters by now, you will get no more from me. Instead, let's consider the good Bishop Abernathy of the Abundant Life Tabernacle Church in Baton Rouge, Louisiana and his robot phone dialler.

The Bishop is one of the prophets of the new robot phone call age and uses a micro/phone system to keep in touch with his flock and to canvass beyond it. This is a phenomenon that threatens to change forever the American love affair with the telephone.

Indeed, the break-up of AT&T has already got plenty of Americans mad as hell. In some big spread out states, where local service used to be subsidised by long distance, rates are going up 200% and more. Junk Phones could be the last straw and conceivably make the telephone the biggest election issue in the West.

However, infuriating as it can be to have one's answering machine loaded up with 18 questions about moist cat food or above-ground burial for the whole family, Junk Phone has irresistible figures going for it. All you need to get started is a micro, with voice chip, modem and software that dials your victims and plays them a selection of short message tapes. It's just great for sales leads, political rallying, church attendance and so on. Prices for such systems are down to between $3,000 and $10,000 and sales have reached 1,100 a month, which is double the figure on the previous year.

So more and more phone owners are likely to find themselves dragged from a hot bath only to discover the good Bishop Abernathy's robot enquiring after their spiritual health. Slamming the phone down with a satisfying crunch will only be a short-term solution since, to get a repair person out to fix the phone now costs $100 (used to be free with the old AT&T). Nor are those with unlisted numbers safe, since the sequential type of dialler just chews its way through entire phone systems number by number.

The machines are programmed for maximum on-line civility, of course, and as yet they don't know how to sell, but they work 24 hours a day and they don't need light, air or even coffee to keep them going.

The potential uses are widespread, even thought-provoking. For example, Stag High School in Stockton, California, is using one to page the parents of truant kids, thus saving the school $2 million a year in funds that would be witheld on account of student absenteeism.

Then there was the November Gubernatorial Election in Louisiana where Democrat Ed Edwards had a machine make 60,000 calls during the last days on his campaign and won a landslide victory over ex-governor Dave Treen.

When the first sequential machines showed up in the '70s, the FCC investigated but was forced to conclude that the things were impossible to ban or control, so it seems unlikely that in a big election year, we can expect any efforts in that direction from Washington. If anything, political Junk Phone could be one of the biggest growth areas.

Clearly, frustration levels are going to rise until everyone buys a 'smart' telephone capable of deflecting Junk. This may mean everyone will have two, three or more different numbers that you will need in order to penetrate to a real human ear.

More worrying stuff on the statistics front. A new Lou Harris poll found that 77 per cent of Americans fear computer invasion of their privacy. Worse still, 68 per cent feel that computers must be 'strictly controlled'. Naturally, it was those without computers who believed this most strongly.

In a study of 87 kids aged between five and eight, two Stamford University professors have confirmed the worst sex stereotyping in computer owning families. Dads and sons work up to three hours a day on the micro; the ladies hardly touch it.

One good reason for that may lie in the software. Out of 75 software packs that were rated by these families, only 5 per cent held any interest at all for young girls. And thus of course, parents were loathe to buy micros for daughters.

Apple turnover

The long-running copyright dispute between Apple and Franklin has been settled out of court.

The struggle went into extra time last September when Franklin appealed against a federal court's decision in Apple's favour, and it seemed to be moving towards stalemate when the settlement was announced last week. Franklin will pay Apple $2.5 million, and in return it wins a period of grace to develop products that don't infringe Apple's copyright.

The case goes back originally to 1982, when Franklin started selling its Ace computers as Apple-compatible. Apple sued, claiming that the copyright of its Applesoft ROM has been infringed; Franklin, in the finest tradition of US litigation, counter-sued. In the meantime it has sold an estimated 100,000 computers and had sales of $70 million in 1983.

A spokesman for Apple UK said that the coporation was 'very pleased with the settlement'. He added: 'It is Apple's policy to try to help third party suppliers but when it comes to people trying to rip us off it's a different matter.'

Franklin is said to be moving into the crowded IBM PC-compatible market, where it will find a similar attitude on the part of IBM towards imitators.

An IBM spokesman said last week: 'We do have an open engineering policy. This is quite different from encouraging people to copy the PC. Wherever our copyrights are infringed we'll act on it and act on it vigourously.'

The Acorn IEEE interface at the centre of a control network.

BBC control

A new interface for the BBC, allowing it to control scientific and technical equipment, was released last week. The Acorn IEEE interface will let you connect the BBC to up to 14 IEEE488-compatible devices.

With a price tag of £325 the interface makes a low cost control system possible. Until now these systems have usually cost several thousand pounds, but the cost of a BBC, disk drive, monitor and IEEE interface adds up to under £1,100.

The interface works by establishing the BBC as the controller of an IEEE local area network, and allows the micro to send information to devices as well as receiving data. Typical peripherals will be oscilloscopes, voltmeters, logic analysers and the like.

Trio on Four

It had to happen. Channel 4 has asked itself 'What have computers got to do with real people?' It has decided to answer the question by hiring three actors and making a sitcom/soap opera about this burning issue.

You may have seen the previous series of 'Anything We Can Do'. This starred Helen, a teacher in her early 30s, husband John, a printer, and Helen's dad Mike, a cross between Jock Ewing and Walter Gabriel, 15 months redundant in Milton Keynes.

Last time round the trio was learning about DIY, but now Mike is bored, so they've transferred their attention to computers. PCN's reporter was unable to obtain a satisfactory answer from Channel 4 as to what they'd do when he got bored with micros . . .

The series is in ten parts, each one dealing with one character's encounter with micros. Helen is terrified by the arrival of a BBC B at her school — well wouldn't you be? John discovers video games and becomes a headbanger, and Mike decides to become a big wheel in seed catalogues and buys . . . a Future FX20?

All this is played out against a background of real people, bank managers and accountants, who are unconvincingly helpful and encouraging. Tune in from Sunday March 11 — it could change your life.

Atari treads carefully

By Geof Wheelwright

Atari is in no great hurry to bring its 1450XLD small business computer to this country.

Atari marketing director Eric Salamon told PCN that the company wants to have its new 600XL and 800XL machines firmly established in the UK marketplace before it introduces the more sophisticated 1450XLD. He said he plans a visit to the US this month to finalise plans on the 1450, and to decide on what specifications he wants to include on the machine and how he wants to market it.

In the US, the 1450XLD includes a 254K built-in double-sided dual density slimline disk drive, a speech synthesizer that uses phonemes, a built-in direct-connect modem with built-in telecommunications program and 64K of RAM. It also has all the other standard features of the 600XL and 800XL machines.

It's unlikely that if Atari does introduce the machine here late this summer it will come with the built-in modem, because Atari would then have to wait for British Telecom approval of the modem before it could sell the machine — this kind of approval is neither easy or quick.

Meanwhile, Mr Salamon is hoping the business potential of the 600 and 800XL machines can be realised quickly with the release of new business add-ons. 'The CP/M module is still a reality, but it's not likely to be on the market until mid-84, however we are keen to get that sort of product to market,' he said.

Mr Salamon claimed that people are already beginning to take the Atari computers seriously as business tools and that the recently-released Atariwriter cartridge word processor has been a great success.

Although as he said there is an overlap between the home computer and personal computer market, Mr Salamon added that he doesn't see Atari making a full-blown push in the office computer market at the moment.

Atari's marketing director considers that many small businesses can use Atari machines rather than more expensive business machines. He said that accountants, doctors, dentists and other professionals often buy machines far in excess of what they really need and spend £2,000 on a word-processor when what they really need only costs £1,000.

At the other end of the financial scale, Atari is not planning to transform its successful games machines into computers. Mr Salamon said the company won't be bringing out the Graduate keyboard to upgrade the Atari 2600 VCS games machine into a computer.

'The Graduate keyboard for the Atari 2600 games machine hasn't been introduced because we couldn't get the quality for the price we would have to charge to make the keyboard worth buying,' he said. Atari also couldn't get a big software base or a reasonable memory for a good price, and the company didn't want to be stuck with an unsupported small-memory machine.

The Atari 1450XLD — no estimated time of arrival in the UK yet.

Despite the cancellation of the Graduate, the delay in bringing the 1450XLD to market and Atari's much-reported financial troubles of the past year, Mr Salamon said the company is healthy.

'When a company is having the sorts of problems that we and our competition have been having, you tend to review plans more closely,' he said. 'We are victims of our own success — when any company grows as quickly as Atari has, it has to stop and re-assess plans periodically. Identifying what the consumer is going to want in the next few years is part of that. We are in the market with a long-term view.'

He admitted that Atari introduced too broad a product range in too short a time. The company may have had short-term sales problems, but it is now conducting long-term research and development on both software and hardware. Mr Salamon suggested that because of this approach, Atari is now the best-supported computer in terms of software and third-party software.

■ For more on what Atari has planned for the future and some background about the machines and the company, make sure you keep an eye out for PCN's special 3-part Atari Micropaedia beginning in February.

PERIPHERALS

PCN rounds up the latest add-ons.

Printers: A daisywheel printer from Hal Computers (0252 517171) is due to make its first UK appearance at the Which Computer Show next week. The KDC WP 550, printing at 14 cps and offering densities of 10, 12 or 15 cpi, will cost £399 — this is the one-off end user price. RS 232C or Centronics interfaces, and cut-sheet or fan-fold paper are among the options.

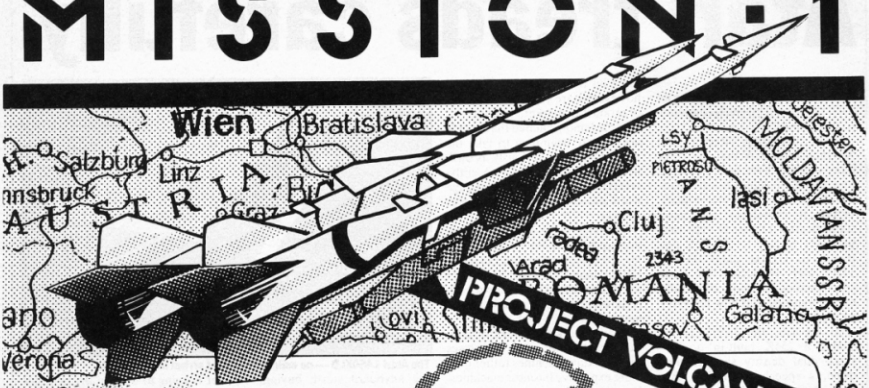
Storage: Ice (01-290 6044) has added the larger devices that it promised when the original members of its Microcube range were launched (Issue 39). These are 21 and 42Mb storage units built around Rodime's 5¼in Winchesters. Like the other Microcubes, they are intended to be used with Apple systems, the IBM PC, Sirius, and Epson QX-10. Intec (01-761 5999) has launched the Intec 505, a removable Winchester built in the UK but designed in the US where it has been in use in 6,000 installations. Early attempts to produce removable Winchesters were dogged by reliability problems and it is worth noting that, according to Intec, not one of these 6,000 sites has reported a head crash. The unit is designed specifically for Apple systems.

Screens: Microcolour Graphics, the Microvitec subsidiary, is launching three new models designed primarily as terminals for larger computers. They are the M2000, M2080, and M2150. Sony has come up with a 14in colour television that it says is ideal for home computer users. The Trinitron KV1430 costs £249.

Sony's KV1430 — a TV designed for a home computer user.

The KDC WP 550 from Hal — £399 daisywheel.

MISSION-1



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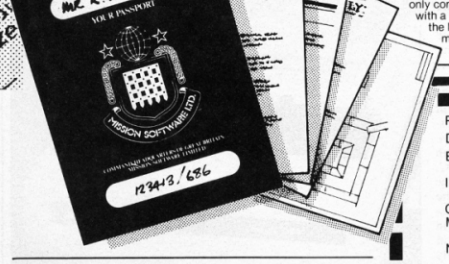

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Plug-in CP/M coming

The combination that successive micro makers have strained to implement, CP/M and Z80, is soon to be offered in one package by digital Research and Zilog.

The logical step of implementing CP/M on a chip is to be made by the two companies with the assistance of American Microsystems (AMI); Personal CP/M will be integrated with the Z80 using AMI's automated chip design software.

Digital Research will provide technical support, and Zilog and AMI will manufacture and sell the operating system/processor chip. The development will probably cause weeping and wailing throughout the micro world where micro makers have struggled to add CP/M, a Z80 and disk drives to their products at the lowest possible cost; but it could be good news for users, putting CP/M-style systems within range for many more than has been the case.

Personal CP/M is a ROM-based version that DR claims is enhanced and easy to use in comparison with the well-established disk-based CP/M. It features help screens and prompts for inexperienced users, and offers more scope for natural language communication between you and your machine, DR says.

John Rowley, DR's president, predicts that the integrated chip will have a considerable impact on home computers in the lower price ranges and that the first systems to feature it could appear within six months.

The company is also tackling another problem relate to natural communication — the tendency of different races to use different languages. To simplify matters it has announced International CP/M, a software product that is intended to let system builders in various countries implement CP/M and derivative operating systems in their native tongues.

With the International CP/M kit not only will manuals be translated by also help files, menus, error messages, prompts and responses. Details like the style of times and dates are also included.

Personal Basic and DR Logo have received the dame attention from DR, which is in the process of translating DR Graph and DR Draw. International CP/M is available to systems houses in France and Germany. Italian, Swedish and Danish are on the way. The one-off price is $2,500.

THAT's LIFE — Once there was the hard sell, with its mirror image the soft sell. Now there's the hard/soft sell, and it is being pioneered by insurance sales staff from Abbey Life. Equipped with an Epson HX-20 in a briefcase and software called Lamp, developed by Cheltenham's The Business House, the man on your doorstep will be able to give you a quote or show you what happens to your money, year-in year-out. Lamp (Life Assurance Marketing Program) plus the briefcase costs £620; The Business House is on 0242 517955. It developed the software in consultation with Abbey Life, which is offering a support service to users. It emphasises (perhaps to re-assure its salesmen) that the system will not replace the rate book.

Junior's key to success?

The IBM PCjr could turn up in the UK with a new keyboard.

Since the launch of the PCjr there has been widespread criticism of the keyboard that IBM supplies. The keys themselves are rubber-domed, and the layout lacks the PC's ten function keys.

Pressure is building on IBM in the US to rectify these shortcomings, and some industry analysts are predicting that an improved keyboard will be ready in the near future. One magazine editor reports that his review machine asked whether the keyboard being used had the standard 62 keys or 83.

SOFTWARE

PCN rounds up the software releases.

Games

Atari: Top-selling US games for Atari systems, including Zaxxon and Caverns of Khafka, have been re-packaged and re-priced by Centresoft for the UK. Zaxxon will cost £14.95, Caverns of Khafka and Slinky £9.95 each. They will be on sale at Boots and other Centresoft outlets.

Spectrum: Ocean Software (061-832 9143) has produced what is thought to be the first golfing game to be modelled precisely on a real course. Royal Birkdale inspired the programmer and its layout is reproduced in moving graphics in the program. The price is £6.90. Beyond Software (01-240 1042) is ringing in the new year with Space Station Zebra, set in the usual remote fastnesses of space. Save the galaxy for £5.95.

Dragon: A new company on the software scene is Sphinx Data and its first offerings are two games called Hydrus and Andromeda, available by mail order only from 43 Lambert Road, Banstead, Surrey at £4.95 and £6.95 respectively. The longer established Imagine is now offering Leggit, an adaptation of its Spectrum game Jumping Jack which has been enhanced by the addition of sound and music.

US software repackaged and repriced by Centresoft.

Commodore 64: Also from Imagine is an improved version of its top selling Arcadia which offers 16 sprites and more levels of play than either the Spectrum or Vic versions.

Education

Spectrum: Sulis Software (0225 61929) is aiming to bridge the gap between 'zap and alien' games and heavy educational programs with a series of 'leisure learning' programs. On offer are Time Traveller (history), Beseiged and Golden Apple (spelling word games), Just a Mot (French vocabulary) and Masterbard (Shakespeare). Sinclair now has the Cattell IQ Test working £12.95) together with Chess Tutor I and Magnets (both £9.95).

BBC: The Sulis programs (see above) are also available for the Beeb. Micro Power has produced Which Salt, a program suitable for 4th and 5th year pupils. It costs £6.95.

Apple: Latest offering from Pete & Pam is a series of four maths programs under the MicroMath title. Dealing with addition, subtraction, multiplication and division, the four program set is available at £19.95 plus VAT. From the same outlet are four packages from PDI Educational Games: Reading Comprehension, What's Different; Story Builder/Word Master; Pre-School IQ Builder; and Memory Builder: Concentration. All are priced at £14.95 plus VAT (on disk).

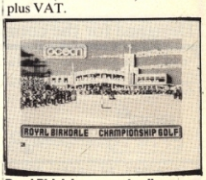
Utilities/Systems

Spectrum: Sinclair can help you with your printing problems with its Prints Utilities package. Price £9.95.

IBM: IP Sharp (01-370 4567) has squeezed its mainframe APL language on to the PC for £250. It offers full compatibility with the mainframe version and should be available by the end of March. A further version for the XT/370 will be available in the Autumn.

CP/M: Encotel (01-680 6040) has launched Bisync 3270 and 3780/2780 emulators to allow connection to IBM mainframes. The emulators are available on disk for £514.

Apple: Accent Software's TGS (The Graphics Solution) can now be obtained from Pete & Pam for £99 plus VAT. The program is a graphics editor and animation system that allows you to combine graphics and text in a manner similar to making a movie film. Also from Pete & Pam is a new version of top ten business program DB Master (Version Four) at £239.95 plus VAT.



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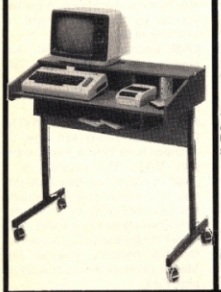

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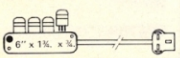

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PCN charts

Hardware Top Twenty up to £1,000

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
1	(1)	Spectrum	£99	(SI)
2	(2)	CBM 64	£220	(CO)
3	(3)	BBC B	£399	(AC)
4	(6)	Sinclair ZX/81	£45	(SI)
5	(4)	Vic 20	£140	(CO)
6	(5)	Oric 1	£99	(OR)
7	(7)	Dragon 32	£170	(DD)
8	(16)	Atari 600XL	£160	(AT)
9	(11)	Lynx 48/96	£225	(CA)
10	(10)	Sharp MZ700	£240	(SH)
11	(12)	Apple IIe	£750	(AP)
12	(9)	TI/994a	£90	(TI)
13	(8)	Atari 800	£300	(AT)
14	(13)	Colour Genie	£168	(LO)
15	(15)	Sharp MZ80A	£349	(SH)
16	(18)	Aquarius	£70	(MA)
17	(14)	Tandy Colour	£180	(TA)
18	(17)	Epson HX20	£472	(EP)
19	(–)	CGLM5	£150	(SO)
20	(19)	Newbrain A	£269	(BW)

These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets in the two weeks up to December 20.

Neither mail order nor deposit-only orders are included in these listings. The prices quoted in the hardware charts are for the no-frills models and include VAT. Information for the stop-selling micros is culled from retailers and dealers throughout the country and like the games, is updated every alternate week.

PCN Charts are compiled exclusively for us by MRIB (Computers), London (01) 408 0250.

Top Ten over £1,000

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
1	(2)	IBM PC	£2,390	(IBM)
2	(1)	ACT Sirius	£2,525	(ACT)
3	(6)	Apricot	£1,719	(ACT)
4	(4)	Commodore 8000 series	£1,200	(CBM)
5	(4)	Apple III	£2,780	(AP)
6	(7)	Kaypro	£1,949	(CKC)
7	(10)	Televideo TS-800 series	£1,495	(MD)
8	(5)	HP86A	£1,570	(HP)
9	(9)	DEC Rainbow	£2,714	(DEC)
10	(8)	Epson QX10	£1,995	(EP)

Distributors: AC Acorn **ACT** ACT/Sirius **AP** Apple **AT** Atari **BW** Brainwave **CA** Camputers **CKC** CKC Computers **CO** Commodore **DD** Dragon Data **DEC** Digital Equipment **EP** Epson **HP** Hewlett-Packard **IBM** IBM **LO** Lowe Electronics **MA** Mattel **MD** Midlectron **OR** Oric **SH** Sharp **SI** Sinclair **SO** Sord **TA** Tandy **TI** Texas Instruments
Machines: SP Sinclair Spectrum **AC** Acorn BBC **64** Commodore 64 **V20** Commodore Vic 20 **81** Sinclair ZX81 **DR** Dragon **OR** Oric **AT** Atari

Games Top Thirty

	GAME TITLE	PUBLISHER	MACHINE COMPATIBLE									PRICE
			SP	AC	64	V20	81	DR	OR	AT	OTHERS	
► 1 (1)	Atic Atac	Ultimate	★									£5.50
▲ 2 (3)	Lunar Jet Man	Ultimate	★									£5.50
▼ 3 (2)	Valhalla	Legend	★									£14.95
▲ 4 (7)	Chequered Flag	Psion	★									£6.95
▲ 5 (10)	Pyramid	Fantasy	★									£5.50
▼ 6 (4)	Ant Attack	Quicksilva	★									£6.95
▼ 7 (5)	Splat!	Incentive	★									£5.50
► 8 (8)	Flight	Psion	★				★					£6.95
▼ 9 (6)	Metagalactic Llamas	Llamasoft				★						£6.00
▼ 10 (9)	Hobbit	Melbourne	★	★	★				★			£14.95
▲ 11 (15)	Hunter Killer	Protek	★									£7.05
▲ 12 (14)	Kong	Ocean	★									£5.90
▲ 13 (17)	Arcadia	Imagine	★		★	★						£5.50
▲ 14 (–)	Mr Wimpey	Ocean	★									£6.90
▲ 15 (23)	Falcon Patrol	Virgin			★							£7.00
▼ 16 (11)	Horace and the Spiders	Psion/Melbourne	★									£6.95
▲ 17 (–)	Snooker	Visions	★									£8.95
▲ 18 (–)	Moonbuggy	Anirog			★							£7.00
► 19 (19)	Hovver Bovver	Llamasoft			★							£7.50
▲ 20 (–)	Dimension Destructors	Artic	★									£5.95
▼ 21 (13)	Manic Miner	Bugbyte	★									£5.95
▼ 22 (20)	Mad Martha II	Mikrogen	★									£6.95
▲ 23 (–)	Cuddly Cuthbert	Interceptor			★	★						£8.00
▲ 24 (–)	Penetrator	Melbourne	★									£6.95
► 25 (25)	Zzoom	Imagine	★			★						£5.50
▲ 26 (–)	Rommel's Revenge	Crystal	★									£5.50
▲ 27 (–)	Siren City	Interceptor			★	★						£8.00
▼ 28 (22)	Gridrunner	Llamasoft	★		★	★		★		★		£5.00
▲ 29 (–)	Twin Kingdom Valley	Bugbyte			★	★						£9.95
▲ 30 (–)	Death Chase	Micromega	★									£6.95

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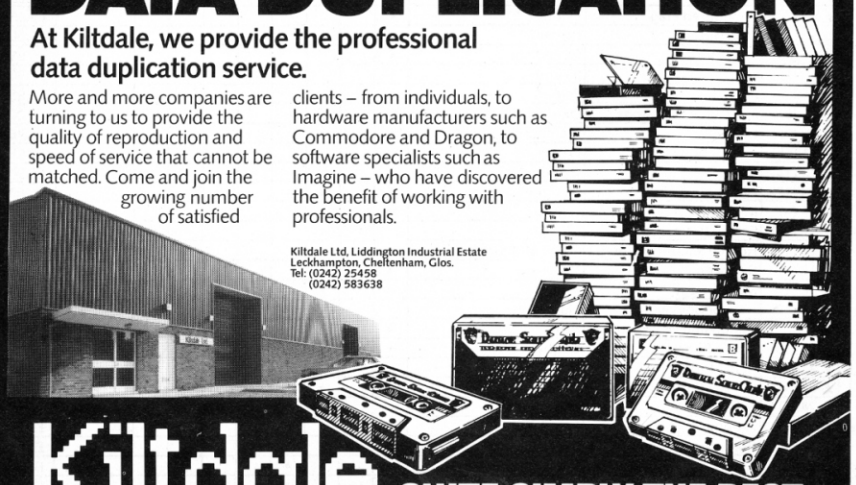

Kiltdale QUITE SIMPLY THE BEST

Don't carry a LOAD on your shoulders, unburden yourself on *PCN*'s letters page.

A helpful hint for Matrix players

To keep you in the festive spirit I think I have discovered a bug in Llamsoft's Matrix to delight many frustrated 64 users who can't get past the first dozen or so screens.

One evening while hindering my friend's play we discovered the bug. If the joystick is pushed left while holding down the fire button, the zone can be cleared by pressing the Commodore key.

It is therefore possible to reach the elusive 20th screen where everything is thrown at you, Camels, diagonal tracking droids, the lot.

Terry Gale,
Wanelly,
South Wales.

Venturing an opinion about Gameplay

Why are you avoiding adventures?

Sure enough, you review the odd adventure now and then, but that's not really helping anyone, is it?

Why not start up a new adventure column? I'm sure the changes from week to week in some other sections are minimal — why not make room for an adventure corner?

Simon Clark,
Watford, Herts.

We never avoid a good adventure — however, should there be a hue-and-cry among readers for a regular adventure feature, we will look more closely at the idea — Ed.

Are reviews just a matter of taste

I was annoyed by Bob Chappell's review of the Oric adventure game Hell's Temple. It is not a maze game, but complex adventure, requiring strategy to win.

Also, the criticisms of the monsters were unfounded; altogether, there are seventy-six monsters all requiring a slightly different approach. There could have been pictures of the monsters, but that would have severly cut their numbers.

What's more, the game is original not just a reworking of Tolkien, and bug free.

The proof of the pudding is in the eating, and Hell's Temple is one of the best adventure games for the Oric.

President,
Hell's Temple Fan Club,
Barnsley, Yorks.

Another school of thought

I am very interested in all these letters in Random Access, as well as your article on educational software, because I am at the receiving end of many of the educational pieces at school. My school (although it is a public school) has seven or eight BBCs, some model As and Bs and an antiquated 380Z. We have also had two of the Bs 'diskified' — one with the Torch Disk Pack and another with a dual drive Cumana. The educational BBC packages we see are all of a very high quality and significantly do not come from Heinemann, Griffin etc but from other schools and colleges via MEP. The only exception is *Edword* from Clwyd Technics, but it is MEP-approved as an educational word processor.

Aside from this, we have found the Torch to be alright after sorting out some trouble with the fuse in the disk pack, but it is noisy. The Cumana seems to be much more temperamental and the error messages "Drive fault" and "Disk fault OE at XX" are annoyingly frequent. Also disks seem to get corrupted easily.

Lastly, I am taking GCE AO Computer studies and agree with many points of David Wild's letter (Issue 41), but some are, in fact, covered in the course. The only problem is the syllabus would have to change monthly or so, to remain up-to-date. The AO course does desire a project (*ie* a program) and though low-level language programs are accepted, the aim is a structured easy-to-follow program which means high-level programming is useful.

Frank Turner,
Clwyd, Rochdale.

Should manufacturers vet micro sellers?

Before Christmas, like thousands of other parents, I was shopping for a home computer for my son. I had started out looking for an Acorn Electron which is a story in itself, but that isn't the point I want to make.

Since I couldn't find an Electron in the big stores I looked around a few smaller dealers on the off-chance. You find home computers in the most unusual places these days, don't you? One that I came across, sitting among reconditioned vacuum cleaners and second-hand black and white TVs, was a hybrid that could be a new species — a Vic 64.

It may seem like nit-picking to say that outside of a certain dealer's window in South London there is no such machine. It was obvious at a glance that the machine on sale was a Commodore 64. It was obvious from the price. But it still sticks in my throat. There is a Vic 20 and there is a Commodore 64. Would anybody buy a computer from a shop that didn't know the difference?

Of course they would, if they themselves didn't know the difference. It may not matter very much: it may be that, having found the machine, they will take it away and never darken the dealer's door again.

But if they do need help after buying it, what kind of assistance are they likely to get from somebody who doesn't know what it is that he's selling?

Is there no way of ensuring that people selling computers can demonstrate a minimum standard of competence? Perhaps the answer lies with the manufacturers since it is their reputations at risk.

Maureen O'Leary,
Camberwell, London
It's their reputations but your money. Buy from a dealer who can give you all the support you're likely to want — Ed.

A Somewhat shakey idea . . .

While reading PCN No 38 I found on the Quit page 'CBS behind the green door'.

It seems that CBS is breaking a cardinal rule and not charging an extortionate price for a software cassette. I picked myself off the floor, and read it again and found they are giving it away.

However, I was brought back to earth when I read that you have to buy a Shaking Stevens cassette.

This seems to me to be both a woolly idea and a good idea at the same time, which is really quite a feat.

But hold, weary traveller. Before you warm up your Spectrum, ponder this thought. Where will it all end? Will we have Abba invaders, Barry Manilow goes rock climbing, The Madness Maze, the curse of Sidney Divine, The Tomb of Kajagoogoo, Paul Young's Diary . . .

Andrew Loch,
Ibroxholm Place,
Glasgow.

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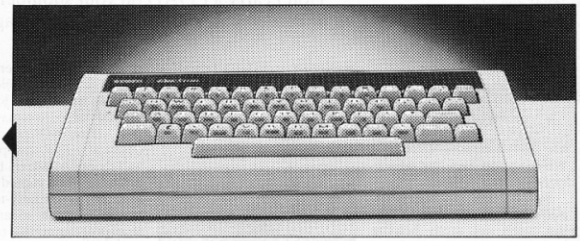

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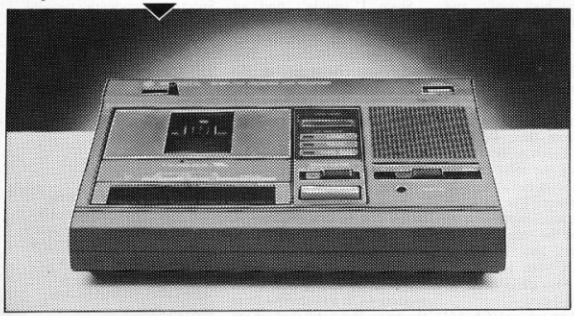

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ZX81 expansion buffer

Q I will soon be one of the many owners of a 16K ZX81. I read in *PCN Issue 2* that the ZX81 could be enornmously expanded and made into a very intelligent machine using one or many of the Basicare Microsystems. A Persona was the first module mentioned and a RAM 16 the second.

Could you tell me exactly what the Persona would do and if the RAM 16 could be exchanged for the ZX Panda 16K RAM. What is the price of the full moving keyboard to go with the modules?

Paul Sammon,
St Helens, Merseyside.

A The Basicare System can greatly increase the memory available to the ZX81 or Spectrum by employing a technique called memory paging – but you must write all your own programs to realise the system's full potential.

The Persona buffers the signals and acts as a sort of interface between the ZX81 and the Basicare system. It doesn't do anything in itself except enable you to add the Basicare modules. It is not possible to use the memory extensions provided by other manufacturers with the system.

The full-moving keyboard is not yet available.

Spectrum interface for typewriter

Q Is it possible to connect my Spectrum to an Olivetti Praxis 41 electronic typewriter: if so what sort of interface would I need?

The typewriter has a connector for connection to an Olivetti RS232C interface, however I think the interface might cost more than it's worth. Also, if it were possible to interface the two what exactly would be the end result?

C M Thompson,
Cheltenham, Glos.

A Yes it's possible, and yes it's likely that it will cost more than it's worth. RS232S for electric typewriters can cost from £75 to £150, so unless you've already got a Praxis, it's liable to be an expensive exercise. Hilderbay is offering Praxis *and* interface for £435.

In order to use it with your Spectrum you'd need an interface, the most logical being the RS232 that comes with Sinclair's own Interface 1.

As for the end result, you won't be able to print the Spectrum block graphics or user defined graphics, but this is a problem you'll often run into with the Spectrum and professional printers.

Getting BBC screens taped

Q Is there any way of saving a BBC screen print to tape? I know that the Spectrum has the command SCREENS for this, but can it be done on the BBC, and how?

Jonathan Loose,
Chelmsford,
Essex.

A Saving screens to tape on the BBC is relatively straightforward if a little slow. You merely save the section of the memory containing the screen information. The amount of memory varies depending on which screen mode is in use and is found by:

```
PRINT ~&8000—HIMEM
```

This will give the amount of memory in hexadecimal for that particular mode.

To save the whole screen simply find the value of HIMEM in hex as this is where the screen starts in memory and use:

```
*SAVE name sss+LLLL
```

SSSs is the hexadecimal start address given by HIMEM for the particular screen mode, and LLLL is the length of the screen given by ~&800—HIMEM. The values for the modes are:

MODEs LLLL=5000	0,1,2	SSSS=3000
MODE LLLL=4000	3	SSSS=4000
MODEs LLLL=2800	4,5	SSSS=5800
MODE LLLL=2000	6	SSSS=6000
MODE LLLL=0400	7	SSSS=7C00

So, for instance, saving MODE 0 graphics use:

```
*SAVE name 3000+5000
```

within the program and reload with

```
*LOAD name 3000
```

The following program demonstrates this.

```
10 MODE 0
20 FOR T=0 TO 1280 STEP 5
30 MOVE 0,0
40 PLOT 6,T,1024
50 NEXT
60 *SAVE SCRN 3000+5000
70 CLS
80 PRINT"REWIND THE TAPE
   THEN HIT THE SPACE BAR"
90 REPEAT:UNTIL INKEY(—99)
100 *LOAD SCRN 3000
```

How compatible is Acorn with Watford?

Q Please could you tell me if the Watford DFS is totally compatible with the Acorn DFS. Is it possible to load programs like the BCPL compiler with the Watford DFS? Will the Watford DFS be compatible with the second processors and future add-ons from Acorn? Would it be safer to buy the Acorn DFS? Also, does the Watford DFS include a disk interface kit, allowing drives to run without any extras?

M Simmons,
Ambleside, Cumbria

A Watford have plans to release a new disk-filing system that is completely compatible with Acorn's in the near future. As yet, whether this will be able to handle all future Acorn releases or not can't be said.

Since they are both similarly priced the only advantage of the Watford DFS is it offers a couple of extra utilities that the Acorn has on disk, or not at all.

Neither DFS comes with a disk interface kit, but both companies will sell you the parts for this.

Colourful adventure writing on the Oric

Q I plan to write a game on my 48K Oric but I don't know how to get different characters in different colours on the screen at the same time. I also want to get a program to RUN using a command in the program itself.

Ian Eden,
Cannock, Staffs.

A To get different colours on the screen in either HI or LORES modes requires that you 'send' an attribute to the screen. In LORES or TEXT this is most easily done by PRINTing a CHR$ in the range 128 to 151 just before the item you want displayed. To have the string "PCN" in red ink on a black background, you would use PRINT CHR$(144); CHR$(129);"PCN". The first two CHR$() control the local INK and PAPER attributes for items to their right.

If you want to use this CHR$ method with PLOT, subtract 128 from the values given.

Another method is to send escape sequences before the displayed item, but this is not without its problems.

```
PRINT CHR$(N)
```

INK	COLOUR	PAPER
128	Black	144
129	Red	145
130	Green	146
131	Yellow	147
132	Blue	148
133	Magenta	149
134	Cyan	150
135	White	151

136 Single-height, standard characters
137 Alternate character set
138 Double-height characters
139 Alternate character set
140 Flashing characters
141 Alternate character set, flashing
142 Double-height, flashing characters
143 Double-height, alternate, flashing

To get a program to RUN itself, simply use the command in a program line (1020 in the example):

```
1000 PRINT "Do you want
     another go?"
1010 GET A$:IF A$<>"Y" AND
     A$<>"N" AND A$<>
     "n" THEN GOTO
1020 IF A$="N" OR A$="n"
     THEN CLS: NEW ELSE RUN
```

ZX language difficulty

Q Please tell me if a German version of the Sinclair ZX81 manual is available.

Hans-Bernhard Korthaus,
Recklinghausen,
West Germany

A Sinclair doesn't publish any German language literature, but the company's German distributor may be able to help. Contact Herr Schumpich, Jurgen Schumpich Gmbh, 8021 Ottobrun, Ottostrasse 28, W Germany.

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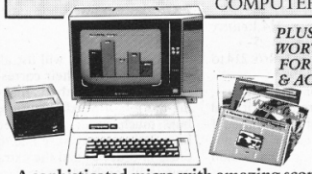

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Commodore 64 PRINT AT simulation

One facility which the Commodore 64 lacks is the PRINT AT command. There are several ways of simulating this command on the Commodore 64, however.

Perhaps the simplest method is as follows:

```
10 REM SIMULATION OF PRINT AT L,C,Z$
20 REM LINE L, COLUMN C; 1<=L<=25, 1<=C<=40
30 POKE 214,L:POKE 211,C-1:PRINT CHR$(145);Z$
40 REM OR POKE 214,L:PRINT CHR$(145);TAB(C-1);Z$
50 REM FOR PET CHANGE 214 to 216 AND 211 TO 198
```

Note that cursor up, CHR$(145), is required (try removing it) and that TAB should only be used if the previous PRINT did not terminate in a semi-colon (again, try it).

It is worth reminding Pet, Vic and 64 users of a bug in Commodore Basic. Typing a line number in the range 350720 to 353279 should result in a "?SYNTAX ERROR", but in practice various responses are possible, ranging from an effect similar to pressing RUN/STOP RESTORE on the 64 (or jump to the monitor in the Pet), to an irrevocable crash.

Finally, two tips relating to the use of cassettes on the Vic and Commodore 64.

An idea of the number of dropouts which occurred on reading a tape can be gleaned from PEEK(158): a value of 4 or less is usually not significant. The file name of the last cassette read or write operation can be inspected with the aid of

```
FOR T=833 TO 849:PRINT CHR$(PEEK(T));:NEXT
```

Nick Higham,
Eccles,
Manchester.

Eye-saving remedy for Basic bodges

Most of us have, at least once, been driven to distraction by the appearance of the much-dreaded "ILLEGAL QUANTITY" error-message, after many hours of typing in reams of DATA numbers. The trouble is that the computer only hints that the error occurs in a READ line, which means poring over the data lines in the somewhat forlorn hope that we spot the mistake.

I have found the following routine a great eye-saver, and I can usually find the error(s) much more quickly. It simply consists of setting up a FOR NEXT loop.

1 On the line immediately preceding the READ statement, type FOR (x) = i (make sure here you use a number larger than the original "FOR NEXT".

2 On the line immediately following the original READ line, type: PRINT (x); (and then follow the original READ variables either singly, or, if there are very many, two or three at a time).

3 On the following line type: NEXT (x):END

Don't forget END

On running, this will list all the variables and their corresponding DATA numbers, making the job of weeding out the bugs much easier. The three lines that you may have had to erase in order to add the extra ones will probably take less time than you would have taken to find the bugs by yourself.

J Holmes,
Glasgow.

Second byte at Lynx numeric variables

In response to a Microwave from Bob Towers (Issue 41) here is an improved version of the numeric variable dump. This program also displays the value of the variable.

To overcome the problem that Mr Towers encountered with his program, *ie* the display of variables not used in the program, this program not only looks at the first byte of each variable, but also at the second byte. If this is &FF the variable is not used in the program. This program is in machine code, so it doesn't use any of the variables.

```
100 DEFPROC VAR DUMP
200 CODE 3E 04 CF 06 01 0E
40 C5 21 07 67 11 05 00 19 10 FD C1
7E FE 00 28 1C FE FF 28 18 23 7E FE
FF 28 12 78 81 CF 3E 3D CF C5 2B
CD B1 35 CD 59 1D C1 3E 09 CF 04
78 FE 35 28 08 FE 1B 20 CA 0E 46 18
C6 3E 1F CF C9
300 CALL LCTN(200)
400 ENDPROC
```

This routine can be renumbered and appended to programs that need to use it.

Andrew Marshall,
Mansfield,
Nottinghamshire.

Commodore 64 restoration

A feature lacking on the Commodore 64 is the ability to 'RESTORE' to a particular line of DATA. The following subroutine is very short and can easily be included in your program, to achieve a 'RESTORE TO LINE'.

Simply set the variable LINE to the required line number, then call the subroutine with GOSUB 60000.

The routine has an error message for non-existent line numbers.

```
10 REM DEMO
20 DATA 1,2
30 FSYS 3,4
40 LINE=30:GOSUB 60000
50 READ A,B:PRINT A,B:END
60 REM
60000 REM RESTORE TO LINE
60010 X0=2048
60020 X1=PEEK(X0+3)+256*PEEK(X0+4)
60030 IF X1=LINE THEN POKE 65,X0 AND 255:POKE 66, (X0/256) AND 255:RETURN
60040 X0=PEEK(X0+1)+256*PEEK(X0+2)-1:IF X0>? THEN 60020
60050 PRINT"?NO SUCH LINE":END
```

David Gristwood,
Sunderland,
Tyne and Wear.

Lynx POKE to invert output to the screen

Using this POKE for the Lynx, the output to the screen can be inverted with a single command.

By using DPOKE &6273,-32 the normal-size characters are inverted and DPOKE &6273,-64 will print inverted large characters. The output can be reset by POKEing in the positive values.

This is a simple example program:

```
10 CLS
20 VDU 24,7
30 PRINT "MIRROR"
40 DPOKE &6273,-64
50 VDU 5,5,5,5
60 PRINT "MIRROR"
70 DPOKE &6273,32
```

S Gray,
Tottemhoe,
Nr Dunstable,
Bedfordshire.

Convert Spectrum decimals to binary

When using the IN function to read the Spectrum keyboard (as described on page 160 of the Spectrum manual), it is useful to know the state of individual bits of the number read *ie* it's desirable to have the number returned in binary.

However, there is no command in Spectrum Basic to convert decimal numbers to binary. This short machine code routine will do just that, providing the first program line is:

```
1DIM a$(8)
```

The string dimensioned in the first line will contain the pattern of the result of the equivalent IN function.

Type in the program as shown. The routine may be placed anywhere in memory (the disassembly shows it in user graphic area for a 48K machine but it can be placed anywhere, just replace start with the start address chosen).

When the routine is in memory it is used as follows: before calling the line, RANDOMISE n must be present (where n is the number from the Spectrum manual of the half row to be read). This should be used just before the routine is called with

```
LET XX=USR start
```

(where start is the start address of the routine)

The string dimensioned in line 1 will now contain the binary equivalent of the result of an equivalent IN function.

```
  10 RESTORE : FOR n=START TO START+28
  20 READ a: POKE n,a: NEXT n
  30 DATA 237,75,118,92,42,75,92,17,6,0,25,237,120,6,8,54,48,203,127,40,2,54,49,203,23,35,16,243,201
```

P J Arundel, Pontefract, W Yorks.

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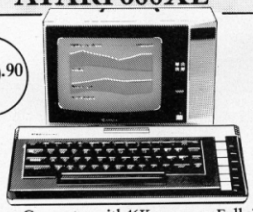

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HONOURABLE

Can the Japanese Hitachi match up to its model the IBM, asks Igor Thomas.

You may feel a little deja-vu slipping into this week's Pro-test, since the Hitachi MBE-16002 is actually a matured version of the Hitachi MBE-16001, released in mid-1983. The product remains the same, only the presentation has been changed to protect the innocent.

Just in case you may not have guessed, the MBE-16002 has more than one or two things in common with the IBM PC series. Starting with equally large manufacturers, the same 8088 processor in the middle, and ending with almost 100% software compatability between the two, you can confidently include Hitachi in the single-figures end of the growing IBM PC look-alikes list.

However, like even the most identical of twins, the Hitachi offers some things which the IBM doesn't, and vice versa. This Pro-test does not dwell greatly upon direct comparisons between the two, but principally approaches the Hitachi in its own right as a 16-bit micro.

Presentation

For once a microcomputer has become *heavier* than its recent predecessors, and *bigger* than its main competitors. As it was being set up, *PCN*'s photographer (also a keen micro hacker) observed that the first impression the MBE-16002 made was 'more like a mini than a micro'. Hitachi themselves have quite inscrutably dubbed the main box as the mainframe, which conjures up all sorts of impressive images.

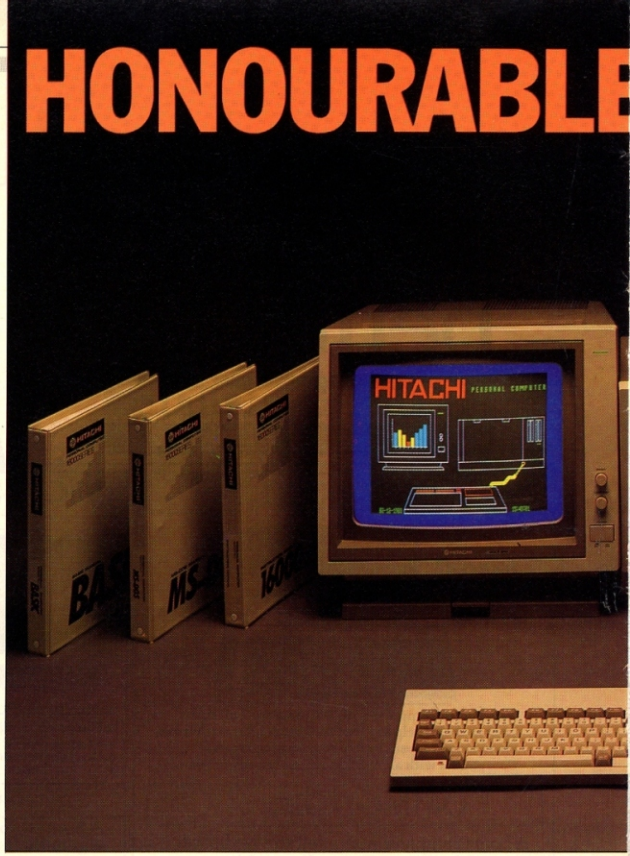
Even if you don't entirely accept this unusual course of events as a Good Thing, your muscles can't help but feel impressed by the sheer mass of the MBE-16002 as it comes out of its packing boxes. Supplied in two large brown cartons (with nothing of great import on the outside) is the classic three-piece suite of keyboard, monitor, and central box of tricks.

The larger, squarer carton carries the 13 inch colour video monitor, cable, and instructions for the monitor controls and adjustments. The other carton contains both the keyboard with its curly cord, and the main computer proper. The packaging also disgorges some floppy disks accompanied by four manuals, one small A5-size, and three larger A4-size.

Construction

Some built-in recesses as handles would have been a nice idea at the setting-up stage, unless you are lucky enough to have some help when moving things around. Suffice it to say, portable this micro is *not*. Since the MBE-16002 doesn't really *look* like a conventional micro, if there is such a thing, it's pretty much up to you how you position the three sections.

The large photo shows how Hitachi envisages the machine should pose, although if space is at a premium, you might care to get radical and stand the mainframe on either end, with drive slots horizontal. No harm would come to the machine if you did this, just as long as you didn't obstruct its cooling fan (at the rear).



The MBE 16002 is being promoted as an affordable mainframe. It's easy to see why — the large box beside the monitor

Hitachi has reduced the usual pre-requisite tangle of wires to nothing more than four, of which two are mains supplies for the monitor and brain box respectively. Both mains cables are of the 'flying lead' variety, and although generous in length, cannot be separated from their owners. Once correctly plumbed into the mains, all that remains to be connected are the video and keyboard cables, both equally painless push-in type connections.

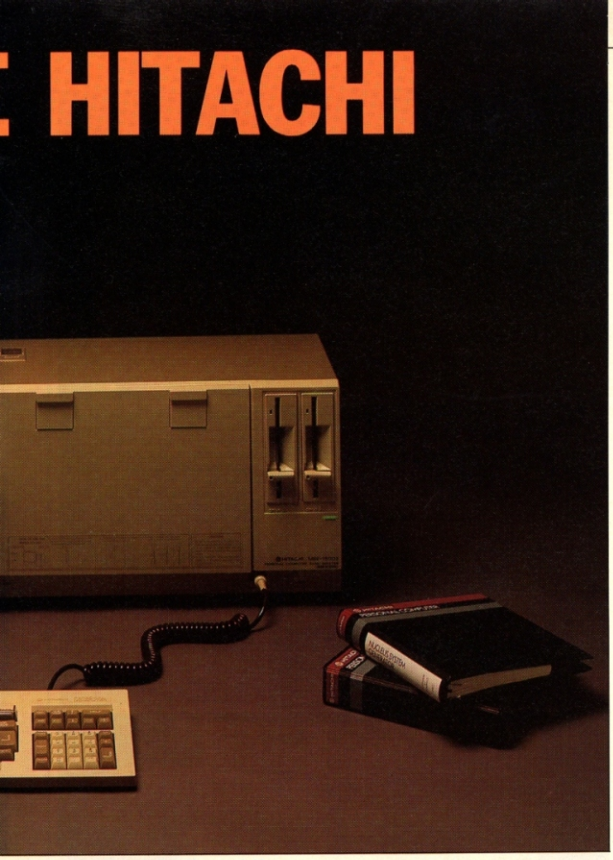
The MBE-16002 doesn't really have a back view as such, since all cable connectors are thoughtfully collected into one single compartment on the right-hand side of the main box (with the exception of the keyboard connector). The video lead to the colour monitor goes in here, and will only mate with the socket marked 'Color'. Also situated here are the standard RS-232 serial and Centronics parallel connectors, ready to accommodate the printer and/or modem of your choice.

Once the keyboard's hunky curly is plugged into its simple socket on the front of the machine, everything is ready for blast-off. At this point, before you apply the juice, you have of course read the instruction manual.

The front of the machine really is a proper clipboard, designed to slide up and down, as well as tilt, holding numerous pages of printouts, shorthand dictation, rice paper, or whatever else you feel an urge to keep clipped in front of you. After a few days acclimatisation, I must admit that there is something wonderful about this unique feature, and I'm sure it will soon threaten to become indispensable.

Even more wonderful than the tilting clipboard, the video monitor has a built-in tilt and lock mechanism. No more piled-up CP/M manuals to raise the display to a comfortable viewing angle. A simple lever at the front of the monitor adjusts the angle of dangle with finger-tip pressure (don't forget, this is a large, bulky, 13 inch RGB rig).

If you must insist on tradition, the whole tilting mechanism can be easily



contains the cpu, drives and adjustable paper holder.

removed by loosening two screws on the underside of the monitor.

Documentation

Supplied with the Hitachi are three matching cream coloured A4 looseleaf manuals containing the documentation for the hardware, the operating system (MS-DOS), and the Basic language (Microsoft GW-Basic). There is a short and sweet little pamphlet included with the monitor describing its retractable knobs and such like. Also supplied is an 'included in the price' software package called Compact Nucleus, presented in a smaller, serious matt black, A5 binding (see software comments later).

The three lightweight cream A4 texts are completely Japanese conceptions, as is the separate little operating guide for the monitor. Connoisseurs of Japanese English will enjoy reading about the 'front and back porch phenomenon' or 'when abnormal odour or smoke is generated'. However, the translation is very good, even if the texts are a touch over simplified.

The Instruction Manual gives simple but complete instructions on all the important aspects of getting acquainted with the MBE-16002. These include care and feeding of the built-in clock (three penlight batteries), keyboard layouts and symbol graphics tables, main software memory map, video memory map, and rudiments of floppy disks.

The MS-DOS Manual describes the MBE-16002's operating system, MS-DOS 1.25. The manual confidently describes the do's and dont's of undertaking 'system' tasks with MS-DOS, such as setting the correct time and date (this is only needed once), selecting a printer, enabling/disabling RAM disk(s), formatting and cataloging diskettes, and other general chores of living with an operating system.

It is at this point that a more experienced micro user will find things a trifle on the innocent side. For example, you only get simple explanations of MS-DOS commands and memory usage, Hitachi assuming either that you don't want to know about the fuller ramifications, or its just keeping the confusion quotient down. There is nothing that a specialist text on the subject couldn't handle when you're ready for it. I just hope that Hitachi UK will be able to document the whims and quirks of MS-DOS 1.25 before I learn enough about the machine to need to know them.

The GW-Basic manual is very simply adapted from the Microsoft original. One wonders if the sample programs were ever intended to be distributed outside Japan. Do you object to examples using names such as 'R. Okita' and 'H. Suzuki'?

You shouldn't try and learn Basic from a reference text, as there are far better instructive books available elsewhere. However, Basic programmers will find very little difficulty in learning the necessary 'wrinkles' of the Hitachi implementation using this manual. Watch out for the quirky quality of the example programs.

The fourth (black A5) manual covers the Compact Nucleus software, supplied 'all-in' with the MBE-16002. This consists of both the Nucleus Report Generator and System Generator programs, which are part of Hitachi's branded software catalogue. Although very well packaged, the copy of the documentation we received for review was only preliminary, and made erroneous references to CP/M instead of MS-DOS.

Keyboard

Unlike most IBM compatable micros, the Hitachi keyboard is styled more along the lines of a real typewriter. None of the silly positions for *shift* and *return (enter)* which some people insist upon. Curiously, for such a good typewriter layout, *shift lock* causes the shift key to reverse its function; lower case letters are produced when shift is used this way. Something of an acquired taste for us older hackers.

Ten healthy programmable function keys bridge across the top of the keyboard alpha (qwerty) section. These appear to be limited (in Basic) to being loaded with no more than 15 characters each. The numeric keypad is to the right as usual, with a modest set of extra cursor and fixed function keys (help, insert, delete) directly above.

Between the programmable function keys and the extra fixed keys is the *cancel* key, which is presently configured to generate control-C at all times, and thus merits a generous plastic shroud, preventing casual operation.

Immediately to the 'rear' of the cancel key is the main *Reset* button; neither too difficult to reach, nor accessable by accident. From underneath the keyboard two stubby legs can be unfolded, improving the 'rake' of the keys. And every depressed key generates a soft piezo-electric click from the inbuilt keyboard sounder.

More in keeping with the traditions emerging in 16-bit micros, the keyboard is actually software-mappable, allowing Hitachi to supply the same hardware to different countries. The UK release of the machine includes a suitably tailored selection of keys, notably of the # and £ keys.

The *copy* key will dump the contents of the text and/or graphics screen(s) directly

20 ▶

◄ 19

to a Microline 84 dot-matrix printer. This includes automatic shading of the eight screen colours, and presumably the correct interpretation of the # and £ characters.

The *help* key doesn't actually help you do anything, unless you are running software with a help system (such as Wordstar) which has been educated about this key. However, when using GW-Basic, pressing the help key conveniently generates a control-A, which Basic understands as a request to repeat the last command entered from the keyboard.

The two groups of cursor keys also vary their functions depending upon the software of the moment. Basic has two forms of editor, both of which use the extra cursor and fixed function keys to insert, delete, and so forth.

Although the overall weight of the keyboard is sensibly generous, the general 'feel' is really disappointing; not very lively would be polite. The return key on our review machine would not reliably respond to anything less than a full 'karate' finger.

The truth is, Hitachi shouldn't have built its own keyboard from scratch though it in fact manufactures the integrated circuits for many of the world's best keyboards.

Screen

In the centre ring, we find the piece of least resistance as far as the MBE-16002 goes. Hitachi has included a snappy 4-bit RGB TTL colour monitor as standard equipment, which would cost upwards of £500 if bought separately. The big 13-inch display is supported by 192K of video RAM, partitioned into multiple screens of text and graphics, which also would be a more than modest extra cost were this not Hitachi!

The 4-bit specification allows each of the eight standard RGB colours to be assigned two intensities under software control. A further elegance is the ability to colour both the background and the normally black 'frame' which surrounds the main image area. Front panel controls are spartan but adequate: *bright*, *contrast*, and *power*. The two knob adjustments may be moved in, reducing the likelihood of little fingers messing up your settings, as well as looking sprauncy in photographs.

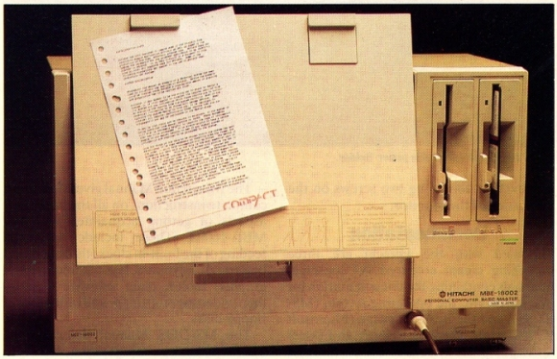
Graphics are very much dependent on the software generating them, but at least GW-Basic allows you to create full screens of either 640 or 320 pixels horizontal by pixels vertical. Text is another matter, with the choice limited to 40 or 80 columns.

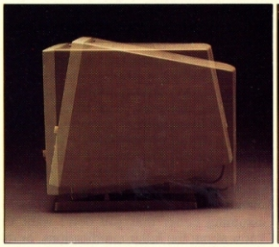
The built-in character set is somewhat disappointing in construction, with pseudo descenders on g,j,p,q,y, and similarly economical bodies on b and d. The + symbol is extremely odd, although I expect most of these definitions could be altered if one had the appropriate software.

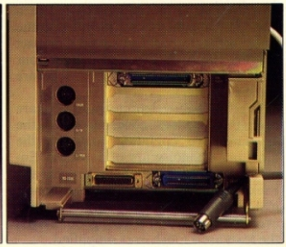
Other benefits make up for this loss, especially in the writing of graphics. First, the multiple graphics and text screens need not be tied to each other; they may 'play' together, but in a stroke of software genius, text can be scrolled separately from any graphics on the screen. It was marvellous writing short graphics programs in Basic,

The keyboard is a real typewriter type with the now standard numeric keypad and ten programmable function keys. The monitor is an impressive 13in RGB colour monitor supported by 192K of video RAM.

The drives are Hitachi-made 5¼in floppies with 320K per drive. The paper-holder is a handy device (also useful for holding floppy disk jackets). Such I/O connections (below) as are necessary are tucked out of sight in an alcove on the drive unit.







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then running them *behind* the same screen full of program lines.

Storage

128K bytes of user RAM is standard, and there's plenty of room inside for more. There are also a few little clever RAM bytes which use the clock batteries to remember your i/o setup parameters while the power is off.

The machine comes complete with two 5 1/4 inch floppy disk drives, which, like every other part of the machine, are also manufactured by Hitachi. They are of slim design, and do not use head-lifting interlocks. This dictates a disciplined approach when removing disks.

In keeping with many other recent micros, the diskettes are formatted for 320K of storage per floppy (40 tracks, 8 sectors per, 512 bytes per, double-sided, double-density). The result is easy portability of text and data files, and most software (such as Basic programs) will emigrate almost as easily. Unfortunately, there are no *guarantees* in any of the Hitachi documentation about compatability, but the specifications given for the diskettes are very clear.

Expansion

The 128K of user RAM supplied with the machine may be increased in two further steps of 128K, to a total of 384K. The two drives may be supplemented with an external unit containing either more drives, or a hard disk. A light pen is also catered for, as well as a monochrome video monitor. The connectors for all peripherals live within the recess of the side compartment, while the RAM expansions are fitted within the actual insides of the machine.

You could be forgiven for assuming that, with its other IBM-like habits, the wide range of IBM specification plug-in expansion cards would also work in the MBE-16002. Sadly, this is not the case, even though the five connectors are of the same size and type as IBM ones. Numerous warnings lurk quietly in the operating manual, deterring end users from attempting to expand the system and advising them to 'ask the Hitachi service engineer'. Details of these connectors are not given in the manuals.

Software

Supplied with the machine are a single system diskette, a number of demo diskettes, and the Compact Nucleus software package. The system disk contains your one-and-only copy of the MS-DOS operating system, so read the manual carefully (and make two disk copies!) before diving in.

All the companion MS-DOS programs, and the GW-Basic, are also contained on the system disk. The currently supplied Basic is Microsoft GW-Basic version 1.5, revision 2.0, which managed to crash itself during a number of short experiments in the *PCN* office. Having some doubts about the purity of the office's electricity supply, I took the machine back to the cave for the weekend. The same programs failed there (on a very reliable mains system), so caution is advised in use of the Basic 'paint' command to fill large non-square shapes.

Portability of any GW-Basic programs is also a little restricted, principally due to the improved Hitachi graphics. If you really intend to move programs from or to the MBE-16002, please be sure that they are saved (and transferred) as ASCII text files. Also, the Basic language program itself is specificly tailored to the Hitachi micro, and will not run correctly on anything else.

One of the more thoughtful enhancements to the Basic is the use of the *alt* key, which causes the Hitachi keyboard to generate complete Basic keywords at a single stroke, along the lines of: I= Input, G = Goto, O = Open, R = Run.

Formatting of a new disk takes a tolerable 70 seconds, as does a complete disk duplication immediately thereafter. The general speed of Basic is very good, and certainly on a par with other IBM-style micros. Also included on the system disk are the very useful Link, Edlin, and Debug programs from Microsoft, although non-technical users may never wish to learn about their convolutions.

The Compact Nucleus is a most curious choice of software to be included as part of the bundle. Authored and documented in Dorking, Surrey, it is claimed to be a program generating program. The manual says that the general aim of Compact Nucleus is to allow non-programmers to generate finished Basic programs, which do things like accounts, reports, databases, and other business applications.

Compact Nucleus itself is written in encrypted Malard Basic, not to be confused with MBasic from Microsoft. The resulting programs generated by Compact Nucleus are themselves written in this unusual brand of Basic. Although the intent of Compact Nucleus is to avoid having to know anything about the writing of the finished program, it strikes me as somewhat odd that such an incompatible type of Basic is used on this otherwise 'standard' machine. Despite the official livery of the packaging, Compact Nucleus is not specifically designed for the MBE-16002, although it seems to work.

Within the world of Hitachi software, there are more Compact Nucleus packages, which may be linked and intertwined with the two supplied. If you are looking for Sales Ledger, Nominal Ledger, other business software, Hitachi has saved you a few hundred pounds by giving you the Report and System Generator packages free with the machine.

Verdict

The overall construction, and appearance, of the MBE-16002 is very reassuring for those of us who look forward to being able to rely on their microsystems to work day after day after day without complaining. The generous colour display and typewriter keyboard layout makes this system a good choice for the first-time business user.

Disk compatibility with other similarly standardised micros is very favourable, and the drives are efficient and quiet. Good ventilation and a built-in cooling fan ensure that the system runs at nothing greater than blood-heat for days on end.

The lack of IBM expansion card compatability is perhaps the main shortcoming of the machine, which is fair enough if, as the sales literature suggests, Hitachi will follow through and offer a range of official expansion cards. In compensation, the built-in RAM interfaces, and colour display provide the most popular accessories as standard equipment.

The present keyboard only seems to please users of manual typewriters, as it lets them maintain their technique. The keyword entry feature in GW-Basic is an excellent touch, and should be enlarged upon.

The bundled software could be more general than Compact Nucleus; something along the lines of a database or word-processor would be nice. Alternatively, a sort of software 'book-token' which allowed a (limited) choice from the respectable collection of applications packages presently available for the MBE-16002 could be included.

The price of the system is perhaps the most attractive feature, although by no means the only one. Hitachi has entered an excellent contender into the IBM heavyweight class, and hopefully it knows a little about Sumo wrestling. PCN

SPECIFICATION

Price	£2,595 + VAT Includes colour monitor, keyboard, main unit, OS and software
Processor	8088, 8087 option
RAM	128K user (expandable to 384K) with parity, 192K screen, in 64K banks
ROM	16K, character generator and BIOS
Text screen	40 or 80 characters, by 25 lines Separately mapped from graphics area
Graphics screen	320 or 640 by 200 pixels eight colours, two intensities, flashing, underscore
Keyboard	10 programmable function keys, separate alpha and numeric sections, 95 keys total
Storage	2 5¼ inch floppy disk drives, 320K each
Operating system	MS-DOS 1.25
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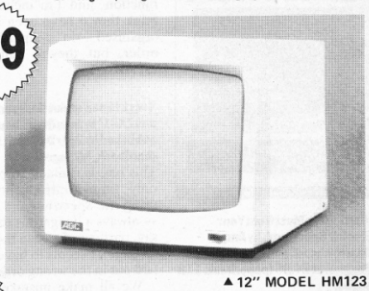

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Which book would your micro want you to buy? *PCN*'s review page helps you choose.

'Getting the Most from Your Sinclair Spectrum', by Anne Sparrowhawk, published by Penguin at £4.95 (paperback, 118 pages)

With the number of introduction to computer books there is around, it's surely high time we had an MSX-style standard for them, allowing beginners upwards compatibility?

Seriously though, they're not all the same, and this one is commendably different, although you wouldn't think so from the first two chapters, which are the standard 'what do you with a micro anyway' and 'now you've got it why don't you open it and plug it in' introductions.

Surely it's about time authors dispensed with this kind of padding?

But after that it really becomes quite interesting, launching into a complicated but accessible flowchart illustration dealing with the processes necessary to start up a car. Once you've related that to how you use flowcharts in programming, Ms Sparrowhawk delves into the innards of the machine, showing you how the information is actually stored.

It's highly unusual for an introduction to computing to do this so early, but the illustrations are well thought out, and I'd say this approach was more successful than the usual parrot-style method of instruction.

However, the book does go off the boil a little towards the end, presenting brief guides to peripherals — surely better in a separate volume, bought after the beginner has come to grips with the machine — and a relatively useless chapter on troubleshooting — perhaps the most difficult area of using a computer.

But there is one last bonus — the appendix presents a particularly clear and detailed explanation of the machine's commands. These are listed in sections depending on their function, and I'm inclined to think they'd have been better organised in alphabetical order, but they're still very useful. **JL**

'I wish I knew about the Spectrum and ZX81' by Jonathan Chapple, published by Beer Davies at £4.95 (hardback, 80 pages)

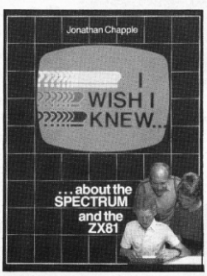
This one is claimed to be 'the only simple introduction' to using the Spectrum and ZX81 — always a dangerous thing to say, particularly when the copy on page 11 seems to have been laid out in the wrong order.

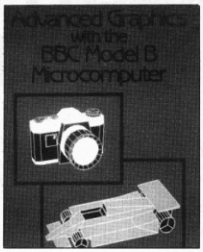
We all make mistakes, but Mr Chapple's book doesn't seem to be particularly simple, especially when compared to a lot of others on the market, and while some things are explained in detail, you'll still find yourself being presented with short programs and being told what they do, but not why and how they do it.

This improves the further you get into the book, but the trouble is that the book doesn't actually go all that far.

It seems to be aimed at parents who've bought micros for their children and want them to know how to use them. So you won't find any space invaders programs — although you will find one space invader, and the penultimate chapter deals with maths, which is a nice change from the usual frivolous content of this type of book.

The amount of information the book contains doesn't really justify the price, and if the Holy Grail is really total simplicity, I'm afraid it has yet to be found. **JL**





'Advanced Graphics with the BBC Model B Microcomputer' by Ian O. Angell & Brian J. Jones from Macmillan Press at £10. (paperback 305 pages)

In the old days of 'big' computers, computer graphics used to be the exclusive province of big corporations such as aircraft and automotive manufacturers.

Then only the most qualified and privileged few actually developed the programs, due in part to the mathematical 'magic' required.

This book attempts to explode this unneccessary mystique by applying many of the 'big' computer techniques to the humble BBC micro. Together with the Royal Holloway College's computer science department, authors Angell and Jones have compressed a complete computer science graduate course into this deceptively small and inexpensive paperback.

Not only do the authors exercise the BBC's graphics facilities to the full, but they produce effects which cannot easily be conveyed in words. If you can appreciate the inherent beauty of 'matrix transformations in three-dimensional space' and 'hidden line and surface algorithms', you already know something of the 'magic' techniques this book contains.

In order to allay your fears of the more advanced mathematics involved, the authors recommend that you simply run the appropriate examples before studying the theories. The book contains more than 180 fully explained BBC Basic procedures.

Even though this must be the most sophisticated graphics text currently available for the BBC Micro, the software and techniques contained within are worth every penny. **IT**

'The Friendly Computer Book' by Jonathan Inglis, published by the BBC at £4.50 (spiral-bound paperback, 222 pages)

This book will be a best friend for those who find themselves sitting in front of a micro, with fingers frozen, all ready and poised and nowhere to go — except forward.

Written by an author who has drawn on his own personal teaching experience, the book concentrates on the most puzzling problems for newcomers to micro computing.

It takes the reader by the hand and gives a complete guide to basic micro programming using the three micros approved for school use by the Department of Industry: the BBC, micro, the RML 380Z and the Sinclair Spectrum although others may find it useful.

The style of the book certainly matches its title; it is friendly and written in an informal manner with the author's illustrations giving humourous insights into the basic principles of computing.

To some extent the book is laid out in the traditional textbook format, with the main points repeated, and summaries at each chapter ending. The very thorough step-by-step instructions are written in an easy-to-read style which is a confidence-builder in that it breaks through the barriers to understanding micros that are harboured by beginners. The clear, simple and logical approach is encouraged throughout.

No claims are made for producing the complete and expert micro programmer, but apologies are not necessary as good foundations for all beginners have certainly been laid.

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Is the writing on the wall for text-only adventure games? John Lettice draws his own conclusions.

The word is out: adventure's graphic

Is the text-only adventure dead? Rumours of its demise may still be greatly exaggerated, but as programmers push the graphics capabilities of micros to the limit, it may not be in the best of health.

The Spectrum was in the forefront of the drive towards graphics adventures, but the Oric and the Commodore 64 are now close behind, the Hobbit being the game that's so far set the pace.

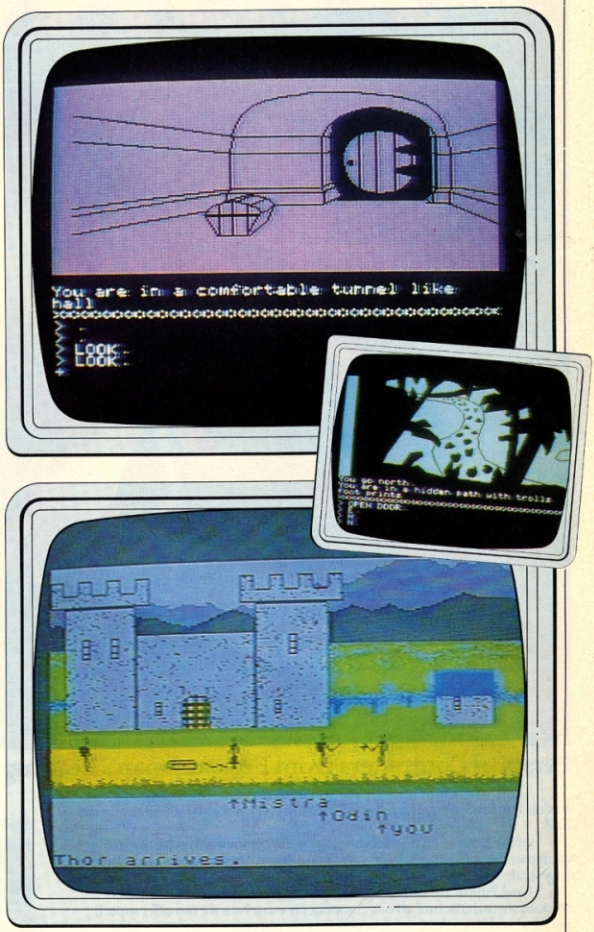
The Hobbit was revolutionary for two reasons; first because it combined a text adventure with high-resolution graphics, and second because it incorporated a form of artificial intelligence in the program. The subsidiary characters (for the purposes of this article we'll assume whoever is playing the game is actually the main character) have a mind of their own, of sorts.

As far as adventures are concerned, this was quite a breakthrough. It meant that adventures, rather than being a series of puzzles you could solve in your own good time, can now have a real time element in them. The most basic example of this in the Hobbit is the tendency of Thorin to tell you (Bilbo) to 'hurry up' if you happen to pause for breath for too long. And of course, in cases of extreme prevarication, the little blighter sits down and starts singing about gold. . .

Along with this you'll find evidence of independent action by the other characters. Someone — Gandalf is the obvious suspect — turns the trolls to stone if you avoid them for a little while. And the cogs are obviously turning in Elrond's brain, because if you spend too long chatting to him, or turn up in Rivendell repeatedly for no good reason, he has a tendency to be rather short with you.

Variable courses of action for the other characters also mean that no two games are exactly the same, and in some cases this can be an unexpected bonus. I have a vivid recollection of trying to talk to Elrond while simultaneously being attacked by a 'vicious warg', which had taken it into its head to wander into Rivendell to check out the action. It doesn't happen often. . .

Following up its success on the Spectrum, the Hobbit is now available on the Oric, Commodore 64 and the BBC, but it has exposed a weakness of the BBC that wouldn't have occurred to anyone a short time ago. The BBC has enough memory for most tasks, and its available memory is comparable to the Spectrum's but 32K just isn't enough to handle the text and graphics, so the BBC version is text only.



The Hobbit combines high-resolution graphics of the locations with the usual text commentary, as can be seen in the two screen shots at the top. Valhalla (lower screen shot) takes this process a step further by allowing the figures in the picture to move, almost like a cartoon.

▶ 29

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The problem is that graphics guzzle memory, so they either need a machine with a fair bit of its memory committed to graphics handling, or they need one with a lot of memory.

But although the Hobbit was revolutionary, there was still room for improvement. The graphics on the Hobbit are detailed, and the characters move from location to location, but you don't actually *see* them move. By a short nose Legend's Valhalla beat the Oracle's Cave on this one.

Valhalla is set loosely in Norse legend, and its most notable breakthrough is that the characters move on the screen. The basic screens are good, although there is an element of 'you've seen one Norse hall you've seen 'em all' to it, but you can actually see the characters fight, eat and pick up objects.

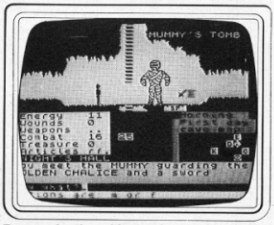
The social side superficially isn't as complicated as many other adventures, but this does illustrate another important point about Valhalla. Ask Elrond for advice in the Hobbit and he'll tell you something on the lines of 'Take the Old Forest road until you get as far as the Bricklayer's Arms, then ask for Aragorn.' But Valhalla's characters are really only concerned with trading objects and hitting people.

So in order to get help from one of the assorted Scandinavian personages present, you have to impress them by hitting people yourself. There are riddles to be solved, but the game is not the traditional succession of riddles. Solving the quests — there are six — is more a case of your building up your personal charisma.

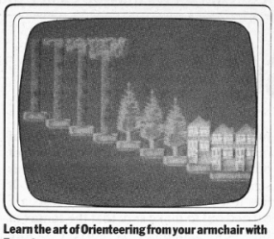
In this sense, Valhalla has more in common with Dungeons and Dragons than it does with the kind of adventure that developed from the first mainframe games, and it tends not to be to the taste of people who've played traditional adventures a lot — but the micro market is changing, and from its sales so far it seems to be to the taste of a lot of people.

While adventures have been developing in this way, arcade games have been coming up to meet them. Ultimate's Artic Atac is a prime example of this. It's an arcade game where you have to battle your way through a succession of haunted rooms — at the very least it's a sort of high-res souped up Pacman.

However, it carries many of the trappings of the adventure game. You can eat, pick up objects, and you have a choice of characters you can be: knight, magician,



Treasure hunting with stunning graphics in the Oracle's Cave.



Learn the art of Orienteering from your armchair with Forest.

serf (surf in the documentation that came with the review copy) etc. Again it's moving towards the role-playing format of Dungeons and Dragons, but it has the high-speed action of arcade games as well.

As far as graphics is concerned, the Oracle's Cave is another front runner. It's a maze-style game set in a series of caverns, which are shown in a scrolling two-dimensional cross-section. Your movement options are up, down, left and right, and when you move, the figure in the centre of the screen walks or climbs while the screen scrolls in the opposite direction.

The figure itself is better articulated than those in Valhalla, and the opposition — serpents, wizards, giant rats and the like — consists of very nice graphics indeed. But these don't actually move, and the high quality graphics do seem to have limited the game in a number of other ways.

Commands are single-letter only, so you can't enter sentences on the lines of 'Attack Gandalf with axe.' The program presents you with a number of options, which vary depending on the situation. Confronted by the giant rat, for instance, you'll tend to find you can move (m) or fight (f). If you opt for movement, you're given the options up, down, left or right. Up is u, which is also shorthand for 'use an object', and leads to some confusion.

If you try to move in a direction not allowed, you're given the option to ask for help, but I found this dumped me back at the entrance of the caverns.

Finding things also seems to be random — you can build up a fair old collection just by looking around the same location repeatedly — and it's difficult to work out what these artefacts can be used for. All in all, the Oracle's Cave seems to have brought sophisticated graphics to the stage where they're draining the Spectrum's memory dry. So there's a very practical reason why the text part of adventures is changing as the graphics are improving.

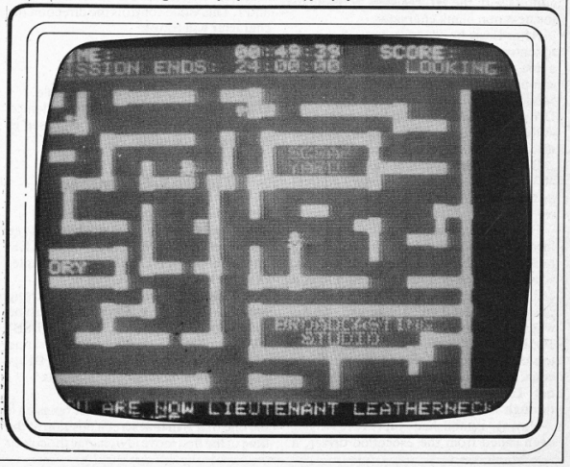
Back in the arcade department, maze games like Ant Attack and Operation Gremlin are also erring on the adventure side. In the case of Ant Attack you're being pursued through a 3D maze by giant ants, and Operating Gremlin claims to be 'a mixture of adventure and intrigue', where you have to search for weapons to destroy the gremlins infesting a scrolling city. Extra zip is injected by your being not one but eight characters. You switch between these in a style similar to that used in some of the better football games.

And finally there's The Forest, which is actually an orienteering simulation, but is a possible candidate for the world's most realistic adventure game. You hack your way up hill and down dale, checking in at the various control points with the aid of your trusty maps (very nice graphics) and compass.

The point seems to be that the boundaries between categories of games are breaking down, to the extent where we'll soon be seeing cartoon-quality games somewhere between arcade and adventure.

Walt Disney could certainly cash in with the Sorceror's Apprentice . . . PCN

Operation Gremlin is the ideal game for split personalities, you play 8 characters.



On the Colour Genie manipulation of characters may be easier than you thought says Keith Hook.

Colour scheme

The Colour Genie doesn't have sprites, but you can make life less painful by designing a command to move your characters around the screen. This can work almost with the speed of machine code, but from Basic.

And you don't have to use all those Peeks and Pokes other machines need to control every move. Once initialised with three parameters, the routine will update itself and keep a check on colour, position and character code.

When Basic Keywords are entered into a program line, the computer checks their legality then replaces them with special values, called tokens, which the Interpreter will recognise when the program is run. So one of the first problems is getting the computer to accept the new keywords in the absence of a legal token.

In a previous article (*PCN issue 32*), I demonstrated how to intercept the keyboard scanning routine to add a MERGE utility with a keyboard bleep thrown in. This method is fine in the Direct Command Mode, but in the RUN mode the interpreter itself must be intercepted. The secret of the success in this exercise is the RESTART instruction, RST10Hex.

RST10Hex is one of eight unique one byte instructions. Its address is in Page Zero (MSB00) of ROM. Fortunately the Rst10 routine is re-vectored from ROM to address 4003Hex in RAM, which holds the instruction JP 1D78Hex. This routine increments the HL register pair, then tests the character in these registers. It skips over any blanks, down arrows and shifted left arrows, and returns to the calling address with the HL registers pointing to the next non blank character.

After Basic has done its housekeeping, tokenised all the keywords and checked for a line number (if one is present, and the computer is not in Direct Command Mode), control is passed to the Execution Driver at 1D5A Hex. The first instruction in the execution driver is RST10, which is where we can intercept Basic execution.

Because the RST10 is re-vectored to 4003Hex, you can place your own address in this location and intercept all RST10 calls.

But other routines use the RST10 instruction, so we have to make sure we are intercepting the execution driver and not some other routine. Because RST10 is a call instruction its return address will be pushed onto the stack. The return address when called by the execution driver is 1D5BHex. By examining the value at the top of the stack, we can intercept if it is equal to 1D5BHex, or allow a return if it is not. The coding from 4909 (in the listing) through 4912Hex carries out this test.

Having established that RST10 has been called from the execution driver, a further test is carried out to see if it is one of our statements. The signal that it is one of our statements, is: 'N' (shifted @). This sign must prefix all the new commands. If this test proves positive, further tests are carried out to make sure that the syntax of the new statement is correct before executing the subroutines.

These tests are carried out by the RST 08Hex instruction, which compares the character pointed to by the HL pair with the character in the return address at the top of the stack. RST08Hex calls RST10Hex before returning to the calling address, *eg* the coding in lines 493A through 4946Hex.

After executing the sub-routine you exit from the program through ID78Hex (RENT).

Program outline

There are three commands that are available within this sub-routine.

MOVE This instruction moves a predetermined character around the screen in seven directions. Depending on how much code is used in the Basic program, some kind of a delay loop will have to be used to slow down the movement.

STASH Saves the whole of the screen and the whole of the colour RAM in a special buffer.

DISP Recalls the screen and the colour RAM from the special buffer previously saved under the STASH command.

Program syntax

MOVE(n) Where n is a number between 0 and 7. This value controls the direction the character will travel:

1	2	3
0		4
7	6	5

n can be a constant (0-7) or a variable.

STASH and **DISP** are already explained above. All commands can be also used in the direct input mode.

The MOVE command

Set up the following parameters:

Character: the code for your character, *eg* 192 (as in CHR$(192)), must be POKED into address 4A9DHex. For example, POKE&H4A9D,192.

First Address: Wherever you are starting your movement from, this address must be poked into addresses 4A9EHex (LSB) 4A9FHex (MSB). For example, starting address middle of screen 45CBHex POKE&H4A9E,&H00CB:POKE&H4A9F,&H0045.

The COLOUR the character takes on is the one that is in that screen position at the time of the first move. To change the colour of the character, POKE the colour RAM with the correct colour before the next move. The program will keep an update of its screen position after the first address has been given. If you wish to change the character at any time, re-POKE the address 4A9DHex.

You will notice that there is a space in the machine language listing which states you can add more commands. Just follow the syntax checking then jump to your own routine. But make sure your new verb is prefixed by 'n' and *does not contain a reserved word* or else you will get a syntax error.

To fully understand how the program works and how to check if your character has collided with some object, type in Listing 2 and see how it works. Finally, make sure that you do not allow your movement to go off the screen, otherwise your character will be POKED through RAM until it has destroyed any program there.

I suggest you CSAVE any basic program before testing it. Screen boundaries can be set up by:

1 X=PEEK(&H4A9F)×256+PEEK (&H4A9E)
2 IfX-40 17408 then MOVE(6)

Line one Gets the value of the characters position from program.

Line two Say you had a value of-MOVE(2) which moves up vertically, then if the next address up, which is −40 screen positions, is less than the start address of screen, move the character vertically downward.

▶ 30

```
                ORG  4900H
                ;**************************************
                ;MACHINE LANGUAGE UTILITY PROGRAM
                ;TO MOVE A CHARACTER AROUND THE
                ;SCREEN FROM WITHIN A BASIC PRO-
                ;GRAM.
                ;PLUS:SAVE SCREEN AND COLOUR RAM
                ;UTILITY.
                ;RECALL SCREEN AND COLOUR RAM
                ;UTILITY.
                ;(C) Personal Computer News 1982.
                ;**************************************
                ;
                ;
                ;
RENT+EQU  1D78H   ; RST 10H CALLS
                  ; THIS SUBROUTINE.
SCREEN+EQU  4400H ;SCREEN START.
COLRAM+EQU  0F000H ;COLOUR RAM
INIT+LD   HL,EXTEND ;LOAD OUR
          LD   (4004H),HL ;START  INTO
               ;RST10H JUMP VECTOR ADDRESS
          JP   1419H  ;RETURN TO BASIC
;
;
EXTEND+EX   (SP),HL ;GET ADDRESS
                    ;FROM TOP OF STACK
          LD   A,L    ; LSD INTO A
          CP   08H
          JR   NZ,GOBACK ; CALLING ADDRESS IS
                    ; NOT THE ONE WE WANT
          LD   A,H    ; IF LSB =08H THEN TEST MSB
          CP   10H
GOBACK+EX   (SP),HL ;RESTORE STACK
          JP   NZ,RENT ; CALLING ADDRESS NOT
               ; ID78H
          CALL RENT ;GET NEXT CHARACTER FROM
               ;INPUT STREAM INTO A.
          CP   ':'    ;IS IT OUR CHARACTER
          JR   Z,TEST ;IF IT IS GOTO NEXT TEST
          DEC  HL     ;ELSE RESTORE NORMALITY
          JP   RENT   ; AND EXIT THIS PROGRAM
TEST+PUSH HL        ;SAVE POINTER TO
                    ;INPUT STREAM.
          CALL RENT ;GET NEXT CHARACTER.
          CP   'N'    ;DOES IT BEGIN WITH 'N'
          JP   Z,SET1 ; YES THEN IT MIGHT BE
                    ; OUR MOVE COMMAND.
          CP   "S"    ;CHECK STORE COMMAND
          JP   Z,SAVE ; GO AND CHECK.
          CP   "D"
          JP   Z,LOAD1 ; CHECK DISP COMMAND
;
;** YOU CAN ADD MORE COMMANDS HERE
;
          POP  HL     ;NONE OF OUR COMMANDS
          DEC  HL     ;RESET POINTER AND
          JP   RENT   ;EXIT.
;**MOVE ROUTINE STARTS HERE.
;
SET1:POP  HL        ; GET POINTER TO INPUT
                    ; STREAM.
          CALL RENT ;GET NEXT NON BLANK CHAR
          RST  08H  ;TEST FOR
          DEFB "M"  ;OUR COMMAND
          RST  08H
          DEFB "O"
          RST  08H
          DEFB "V"
          RST  08H
          DEFB "E"
          RST  08H
          DEFB "("
```

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COLOUR GENIE

```
4947 CD7649      CALL EVAL
494A 2A9E4A      LD   HL,(CURPOS) :HL=SCREEN POSITION
494D FE00        CP   0      :CHECK DIRECTION  VALUE IN
                 :A REGISTER.
494F 283C        JR   Z,LEFT
4951 FE01        CP   1
4953 284D        JR   Z,LUP
4955 FE02        CP   2
4957 2861        JR   Z,UP
4959 FE03        CP   3
495B 2874        JR   Z,RUP
495D FE04        CP   4
495F CAE849      JP   Z,RIGHT
4962 FE05        CP   5
4964 CAFC49      JP   Z,RDWN
4967 FE06        CP   6
4969 CA134A      JP   Z,DWN
496C FE07        CP   7
496E CA2A4A      JP   Z,LDWN
4971 E1          POP  HL
4972 2B          DEC  HL
4973 C3781D      JP   RENT
4976 7E      EVAL:LD   A,(HL)
4977 FE3C        CP   3CH    :TEST VARIABLE OR CONST
4979 3007        JR   NC,VAR  :YES VARIABLE
497B CD1C2B      CALL 2B1CH
497E 229E52      LD   (TEMP),HL :SAVE POINTER
4981 C9          RET
4982 CD4025  VAR: CALL 2540H  :PUT VARIABLE IN
                 ACCUMULATOR
4985 229E52      LD   (TEMP),HL :SAVE POINTER
4988 CD7F0A      CALL 0A7FH  ! CONVERT TO INTEGER
498B 7D          LD   A,L
498C C9          RET
498D 3620    LEFT:LD   (HL),20H : BLANK OLD CHAR
498F E5          PUSH HL     :SAVE ADDRESS
4990 1100AC      LD   DE,0AC00H :ALIGN TO COLOUR RAM
4993 19          ADD  HL,DE
4994 7E          LD   A,(HL) :SAVE COLOUR
4995 3603        LD   (HL),03H :BLANK OLD ADDRESS
4997 2B          DEC  HL     :ALIGN TO NEW ADDRESS
4998 77          LD   (HL),A :LOAD COLOUR INTO NEW AD
4999 E1          POP  HL     :RESTORE SCREEN POSITION
499A 3A9D4A      LD   A,(CHAR) : GET CHARACTER
499D 2B          DEC  HL     :ALIGN TO NEXT POSITION
499E 77          LD   (HL),A : FILL WITH CHARACTER
499F C33F4A      JP   RET1   :GET READY TO RETURN
49A2 01D7FF  LUP: LD   BC,0-41 : LEFT UP DIAGONAL
49A5 3620        LD   (HL),20H
49A7 E5          PUSH HL
49A8 1100AC      LD   DE,0AC00H
49AB 19          ADD  HL,DE
49AC 7E          LD   A,(HL)
49AD 3603        LD   (HL),03H
49AF 09          ADD  HL,BC
49B0 77          LD   (HL),A
49B1 E1          POP  HL
49B2 3A9D4A      LD   A,(CHAR)
49B5 09          ADD  HL,BC
49B6 77          LD   (HL),A
49B7 C33F4A      JP   RET1
49BA 01D8FF  UP:  LD   BC,0-40 : UP
49BD 3620        LD   (HL),20H
49BF E5          PUSH HL
49C0 1100AC      LD   DE,0AC00H
49C3 19          ADD  HL,DE
49C4 7E          LD   A,(HL)
49C5 3603        LD   (HL),03H
49C7 09          ADD  HL,BC
49C8 77          LD   (HL),A
49C9 E1          POP  HL
49CA 3A9D4A      LD   A,(CHAR)
49CD 09          ADD  HL,BC
49CE 77          LD   (HL),A
49CF 186E        JR   RET1
49D1 01D9FF  RUP: LD   BC,0-39 :RIGHT DIAGONAL UP
49D4 3620        LD   (HL),20H
49D6 E5          PUSH HL
49D7 1100AC      LD   DE,0AC00H
49DA 19          ADD  HL,DE
49DB 7E          LD   A,(HL)
49DC 3603        LD   (HL),03H
49DE 09          ADD  HL,BC
49DF 77          LD   (HL),A
49E0 E1          POP  HL
49E1 3A9D4A      LD   A,(CHAR)
49E4 09          ADD  HL,BC
49E5 77          LD   (HL),A
49E6 1857        JR   RET1
49E8 3620    RIGHT:LD  (HL),20H : RIGHT
49EA E5          PUSH HL
49EB 1100AC      LD   DE,0AC00H
49EE 19          ADD  HL,DE
49EF 7E          LD   A,(HL)
49F0 3603        LD   (HL),03H
49F2 23          INC  HL
49F3 77          LD   (HL),A
49F4 E1          POP  HL
49F5 3A9D4A      LD   A,(CHAR)
49F8 23          INC  HL
49F9 77          LD   (HL),A
49FA 1843        JR   RET1
49FC 012900  RDWN:LD  BC,41  :RIGHT DOWN DIAGONAL
49FF 3620        LD   (HL),20H
4A01 E5          PUSH HL
4A02 1100AC      LD   DE,0AC00H
4A05 19          ADD  HL,DE
4A06 7E          LD   A,(HL)
4A07 3603        LD   (HL),03H
4A09 09          ADD  HL,BC
4A0A 77          LD   (HL),A
4A0B E1          POP  HL
4A0C 3A9D4A      LD   A,(CHAR)
4A0F E1          POP  HL
4A10 77          LD   (HL),A
4A11 182C        JR   RET1
4A13 012800  DWN: LD  BC,40  : DOWN
4A16 3620        LD   (HL),20H
4A18 E5          PUSH HL
4A19 1100AC      LD   DE,0AC00H
4A1C 19          ADD  HL,DE
4A1D 7E          LD   A,(HL)
4A1E 3603        LD   (HL),03H
4A20 09          ADD  HL,BC
4A21 77          LD   (HL),A

4A22 E1          POP  HL
4A23 3A9D4A      LD   A,(CHAR)
4A26 09          ADD  HL,BC
4A27 77          LD   (HL),A
4A28 1815        JR   RET1
4A2A 012700  LDWN:LD  BC,39  :LEFT DIAGONAL DOWN
4A2D 3620        LD   (HL),20H
4A2F E5          PUSH HL
4A30 1100AC      LD   DE,0AC00H
4A33 19          ADD  HL,DE
4A34 7E          LD   A,(HL)
4A35 3603        LD   (HL),03H
4A37 09          ADD  HL,BC
4A38 77          LD   (HL),A
4A39 E1          POP  HL
4A3A 3A9D4A      LD   A,(CHAR)
4A3D 09          ADD  HL,BC
4A3E 77          LD   (HL),A
4A3F 229E4A  RET1:LD  (CURPOS),HL :SAVE NEW POS
4A42 2A9E52      LD   HL,(TEMP) :RESTORE POINTER
                 :INPUT STREAM
4A45 CF          RST  08H    :TEST FOR ')' ELSE SYNTAX
                 :ERROR.
4A46 29          DEFB ")"
4A47 2B          DEC  HL     :ALIGN FOR RETURN TO CALL
4A48 C3781D      JP   RENT   :ADDRESS AND RETURN

;** SAVE SCREEN ROUTINE START
;
4A4B E1      SAVE:POP  HL     :GET POINTER
4A4C CD781D      CALL RENT   :AND GET NEXT NON BLANK
                 :CHARACTER.
4A4F CF          RST  08H    :AND CHECK SYNTAX OF
4A50 53          DEFB "S"    :COMMAND
4A51 CF          RST  08H
4A52 54          DEFB "T"
4A53 CF          RST  08H
4A54 410A        DEFB "A"
4A56 CF          RST  08H
4A57 53          DEFB "S"
4A58 CF          RST  08H

4A59 48          DEFB "H"
4A5A D9          EXX         :SAVE BASICS REGISTERS
4A5B 210044      LD   HL,SCREEN : GET SOURCE ADDRESS
4A5E 11A04A      LD   DE,STORE  :DESTINATION ADDRESS
4A61 01FF03      LD   BC,03FFH  :BYTES TO MOVE
4A64 EDB0        LDIR        :MOVE THEM
4A66 2100F0      LD   HL,COLRAM
4A69 119F4E      LD   DE,STORE1
4A6C 01FF03      LD   BC,03FFH
4A6F EDB0        LDIR
4A71 D9          EXX         :RESTORE REGISTERS
4A72 C3994A      JP   RET2   :ALL DONE GO TO RETURN
;
;**RESTORE SAVED SCREEN ROUTINE
;
4A75 E1      LOAD1:POP  HL    :AS FOR SAVE SCREEN
4A76 CD781D      CALL RENT
4A79 CF          RST  08H
4A7A 44          DEFB "D"
4A7B CF          RST  08H
4A7C 49          DEFB "I"
4A7D CF          RST  08H
4A7E 53          DEFB "S"
4A7F CF          RST  08H
4A80 F0          DEFB "P"
4A81 D9          EXX
4A82 219F4E      LD   HL,STORE1
4A85 1100F0      LD   DE,COLRAM
4A88 01FF03      LD   BC,03FFH
4A8B EDB0        LDIR
4A8D 214D4A      LD   HL,STORE
4A90 110044      LD   DE,SCREEN
4A93 01FF03      LD   BC,03FFH
4A96 EDB0        LDIR
4A98 D9          EXX
4A99 2B      RET2:DEC  HL     :ALIGN POINTER
4A9A C33F4A      JP   RENT   :AND EXIT
4A9D 00      CHAR:DEFB 00H   :CHARACTER STORE
4A9E 0000    CURPOS:DEFW 0000H  :SCREEN POSITION
                 :2 BYTE ADDRESS
4AA0         STORE:DEFS 03FFH  :SCREEN BUFFER
4E9F         STORE1:DEFS 03FFH  :COLOUR BUFFER
529E 0000    TEMP:DEFW 0000H  :POINTER STORE
                 EXEC INIT
52A0 00          NOP
                 :CHAR BUFFER:- 4A9DH
                 :SCREEN BUFFER:- LSB 4A9EH
                 :              MSB 4A9FH
                 : ##### SEE NOTES FOR DETAILS OF
                 : ##### USING THE UTILITY.
                 :
                     END
Exec Addr 4900
```

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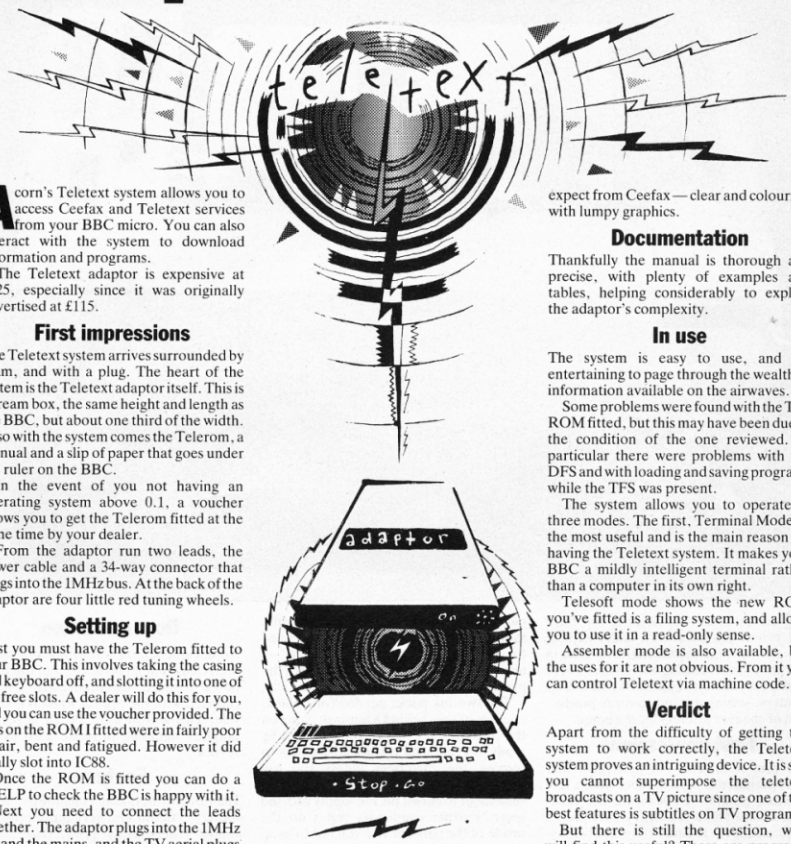
A Ceefax and Teletext adaptor for the BBC micro is tested out by Piers Letcher.

Adaptable Acorn



Acorn's Teletext system allows you to access Ceefax and Teletext services from your BBC micro. You can also interact with the system to download information and programs.

The Teletext adaptor is expensive at £225, especially since it was originally advertised at £115.

First impressions

The Teletext system arrives surrounded by foam, and with a plug. The heart of the system is the Teletext adaptor itself. This is a cream box, the same height and length as the BBC, but about one third of the width. Also with the system comes the Telerom, a manual and a slip of paper that goes under the ruler on the BBC.

In the event of you not having an operating system above 0.1, a voucher allows you to get the Telerom fitted at the same time by your dealer.

From the adaptor run two leads, the power cable and a 34-way connector that plugs into the 1MHz bus. At the back of the adaptor are four little red tuning wheels.

Setting up

First you must have the Telerom fitted to your BBC. This involves taking the casing and keyboard off, and slotting it into one of the free slots. A dealer will do this for you, and you can use the voucher provided. The pins on the ROM I fitted were in fairly poor repair, bent and fatigued. However it did finally slot into IC88.

Once the ROM is fitted you can do a *HELP to check the BBC is happy with it.

Next you need to connect the leads together. The adaptor plugs into the 1MHz bus and the mains, and the TV aerial plugs into its back. The BBC is connected up as normal.

Then switch on the adaptor before the BBC. Typing *TELESOFT takes you into the Teletext Filing System (TFS).

Now the adaptor needs to be tuned in. This is done by following a carefully detailed procedure in the manual. A bar chart marked 0-100% gives you the strength of the signal, and twiddling the appropriate red wheel tunes you into a channel.

This incredibly tedious task can take hours. One problem is that all four channels can be received on each of the adaptor's knobs. If the system has been set up as shown in the manual, you find that after several turns your fingers ache since the knobs are on the opposite side of the adaptor to you.

The travel on the knobs is extensive, but the delicacy needed to tune accurately is enormous. This operation requires a lot of patience and an element of skill, and is a most frustrating task.

Once tuned, cellotape the wheels in position—it's something you'd never want to do again.

The pictures are exactly what you'd expect from Ceefax—clear and colourful, with lumpy graphics.

Documentation

Thankfully the manual is thorough and precise, with plenty of examples and tables, helping considerably to explain the adaptor's complexity.

In use

The system is easy to use, and it's entertaining to page through the wealth of information available on the airwaves.

Some problems were found with the TFS ROM fitted, but this may have been due to the condition of the one reviewed. In particular there were problems with the DFS and with loading and saving programs while the TFS was present.

The system allows you to operate in three modes. The first, Terminal Mode, is the most useful and is the main reason for having the Teletext system. It makes your BBC a mildly intelligent terminal rather than a computer in its own right.

Telesoft mode shows the new ROM you've fitted is a filing system, and allows you to use it in a read-only sense.

Assembler mode is also available, but the uses for it are not obvious. From it you can control Teletext via machine code.

Verdict

Apart from the difficulty of getting the system to work correctly, the Teletext system proves an intriguing device. It is sad you cannot superimpose the teletext broadcasts on a TV picture since one of the best features is subtitles on TV programs.

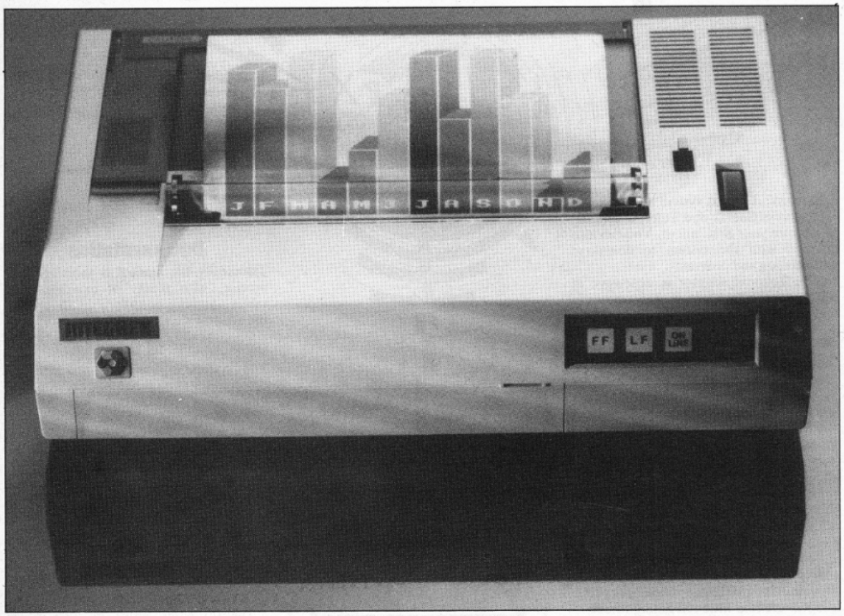
But there is still the question, who will find this useful? There are programs available which can be downloaded into your BBC. But the same programs can be accessed using a suitable TV, and then typed in. The Teletext compatible TV allows you to superimpose the broadcasts onto TV programs.

As the price of other peripherals (especially printers and disk drives) falls, £225 seems very expensive for what boils down to little more than you can get from a Teletext receiving TV.

Product Acorn Teletext **Manufacturer** Acorn Computers (0223) 245200 **Price** £225 inc VAT **Outlets** Retail PCN

Piers Letcher tests a new printer in one of the most competitive peripheral fields.

Hard copy colour



The Integrex Colourjet is the third colour printer at well under £1,000, and only the second ink-jet printer in this price range, costing only £499 + VAT. There has been a rapid influx of colour printers, setting a trend towards production of cheaper printers for the home.

First impressions

The printer arrives well packaged, like most peripherals costing more than a few hundred pounds. Underneath the cardboard/polystyrene is a heavy duty plastic case housing the printer. The only obviously moving parts are the lid (underneath which is the roll of paper), the paper roller, and the paper release lever on the right.

Three touch buttons on the front give you On-line, Form Feed, and Line Feed. Three lights signal the usual On-line, Alarm, and Ready. An on/off rocker switch on the right-hand side, and the two sockets on the back (power and Centronics) complete the outside view.

The printer comes with a sheaf of single sheets of paper, and will take a roll or almost any other paper under 9.5 inches wide. To use tractor feed paper you will have to tear off the edges.

A sensible feature is a lever, under the paper cover, which seals off the ink while the printer is in transport, and it can be used to self test the graphics printing — instructions for this are on the inside of the plastic paper cover.

The two ink packs needed (one black, one colour) are behind a ten-inch panel on the front of the printer. These should be ready inserted, and you are advised not to remove the cartridges unless you are replacing them. In fact you can, if you remember to cut off the ink supply with the lever. Further cautionary notes on the inside of the panel advise you not to swap the cartridges (with a gentle push it's impossible, harder pushes break the printer), or leave the slots empty.

Setting up

This is simple. You have to wire up the mains lead, and buy a lead to run from a Centronics port to the computer. The printer can also be used with an RS232 interface (£140 extra) or a viewdata interface (£165 extra). Obviously the latter includes the RS232, and you can also switch it to Centronics.

The first thing to do is to thread the paper into the printer. This is easily done and never presented any problems.

Documentation

No documentation was supplied with the pre-release model reviewed, but there will be a 40-page comprehensive manual supplied with the printer when it goes on sale. This will include the all important graphics dumping program used in this review.

Features

The printer offers many facilities — seven colours, smooth and very quiet printing, almost letter-quality print, descenders, and full ASCII 112 character set (plus international variants). However it doesn't offer great speed at 37cps, though the quality of the graphics dump makes any quibbles about this seem petulant. A lot of extra software has been added to make this Cannon A1210 into an Integrex Colourjet printer, and the results are quite spectacular.

It's a disadvantage having to type in the 80-line graphics dump program, since this is very technical, and making errors is easy. It's written as a procedure and can be easily tagged on to the end of any program with which you want to use it. I was fortunate enough to be supplied with the program on

39 ▶

BIG JOHN'S CROSSWORD

8

14 15

22

28

33 34 35

38

39

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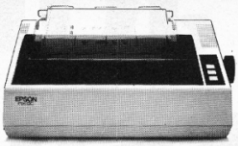

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disk, and it's a pity this isn't going to be a standard service.

In use

Once the printer has been switched on it's worth doing a printer self test. This ensures that the ink is ready for injection and the carriage is unlocked. When you unpack the printer the carriage should be locked to prevent ink getting spread around.

The self test is done by pressing the carriage lock lever down, and holding it there. This lets the ink through. After release the alarm light flashes for ten seconds, and the printer is then ready. After lifting the lever back up, pressing the LF button gives a test print of the three primary colours and black.

To start using the graphics dump program you will have to type it in, and once in your micro it is worth saving it, so that it can be easily retrieved. This procedure enables you to do direct screen dumps.

The printing routine can cater for both normal and large size screen dumps, and both are produced clearly and crisply. The only problem, as with all colour printers, is in the time that this takes. For a normal size screen dump, this is about one and a half minutes, increasing to six minutes for a large dump. The wait is worth it though, since the final results are beautiful, and in some cases better than the results obtainable photographically.

The printer also works in normal mode, printing at a fairly slow 37cps. The full ASCII character set is included, and international variants can be easily obtained.

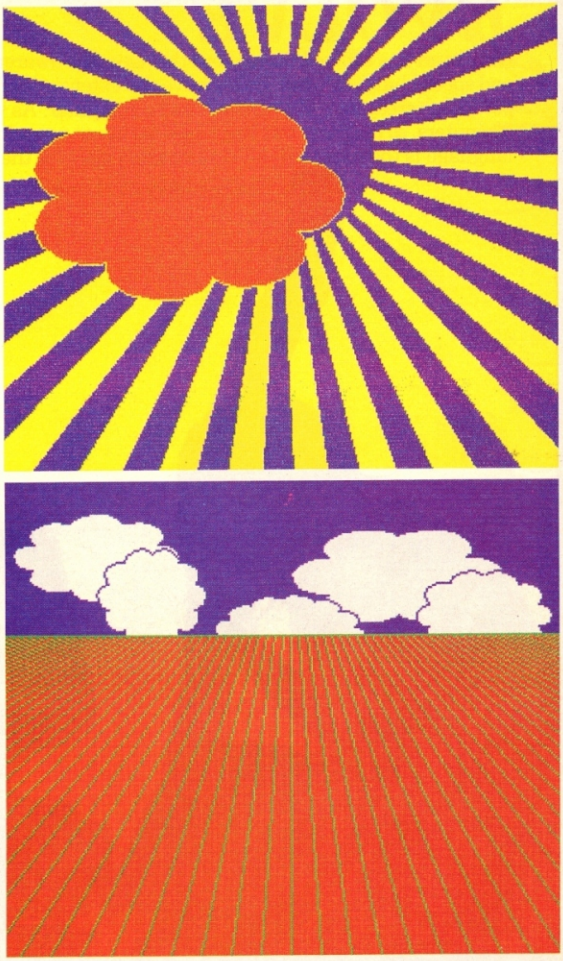
The print quality is good, though it varies, depending on the paper used. The paper provided, whether in rolls or sheets, gives a very fine and impressive finish. But the results are not so good on normal letter writing or tractor feed paper.

One problem is that on some paper types the ink spreads before it dries and smudges the picture, giving a slightly blurred definition. However, a report containing some colour output on normal paper would be impressive. This definition problem applies to the normal mode typing as well, since the printing is still by ink jet.

Inside the printer is neat and the simple ink jet mechanism shows its advantages compared to, for example, the Seikosha GP700A which uses ribbons and a dot matrix, but is both noisy and wearing on the ribbon.

Getting into the printer is simple, though a manual would have helped. Of the six screws on the bottom, three hold on the transformer, and three hold the top and bottom parts of the case together. Selecting the correct three gets you inside. The top comes off easily, and enables you to change the settings on the dip switches.

The colours are accessed by control codes, though without documentation it is difficult to know what these are. The standard control codes used by the BBC (eg CONTROL B and C to switch the printer on and off) are all accepted, and make the printer easy to use. The international variations on the character sets are also selectable.



Results like these are obtainable – if you can afford to wait up to six minutes for a large screen dump. Text printing is also fairly slow at 37 cps.

Verdict

This printer offers colour printing at a reasonable cost. So too do the Seikosha GP700A (£85 cheaper) and the Tandy CGP220 (£75 cheaper). What Integrex offers is better software and a better likelihood of compatibility with your computer (if it's not a Tandy).

The Integrex will shortly be available for the IBM PC, making it easily the cheapest compatible colour printer. It will also be available for the Apple in the near future, and is currently being demonstrated as a hard copy printer for overhead projections.

Retailers will be offering the standard 90 day warranty on the Colourjet, and Integrex has said that it will also have service contracts available. PCN

Product Integrex Colourjet **Manufacturer** Integrex (0283) 215432 **Price** £499 + VAT interfaces Centronics, RS232 £140 extra, viewdata (including RS232 and Centronics option) £165 extra **Outlets** Retail.

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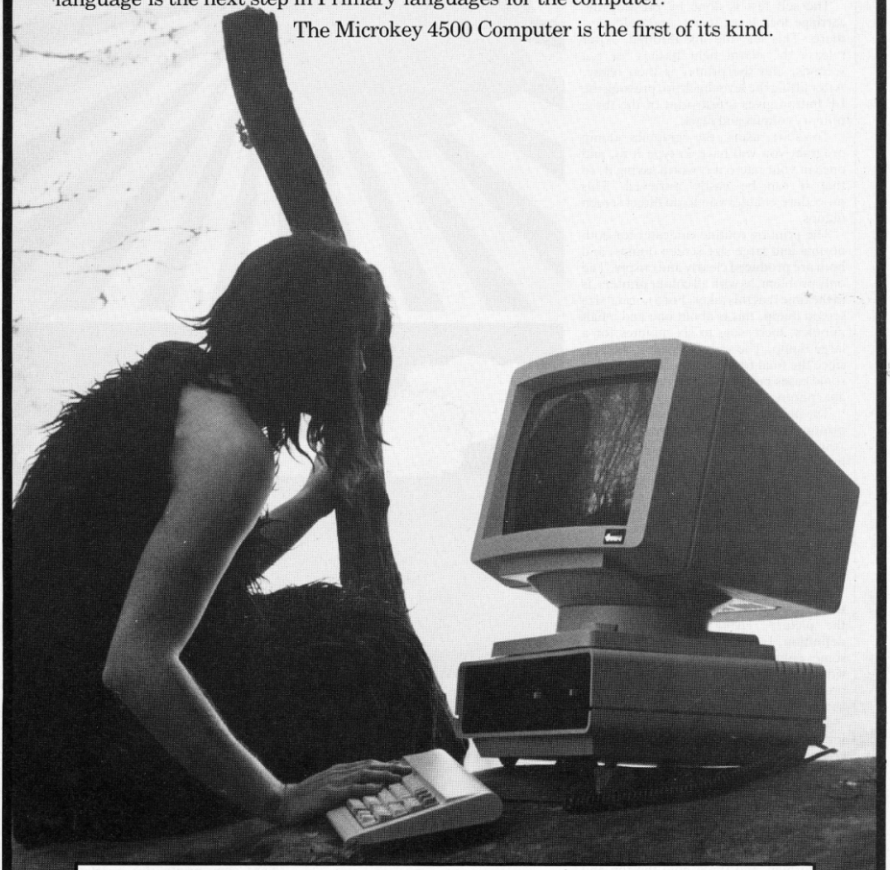

System specification:

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Vol 15 Part 2

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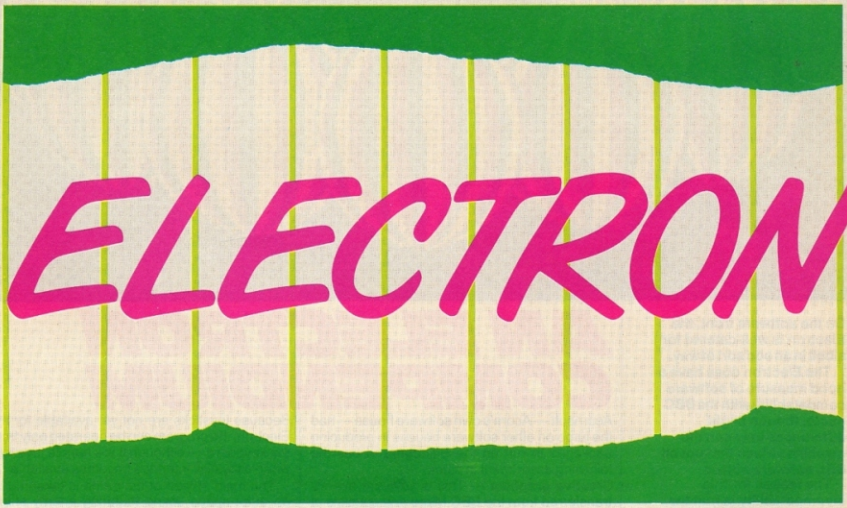
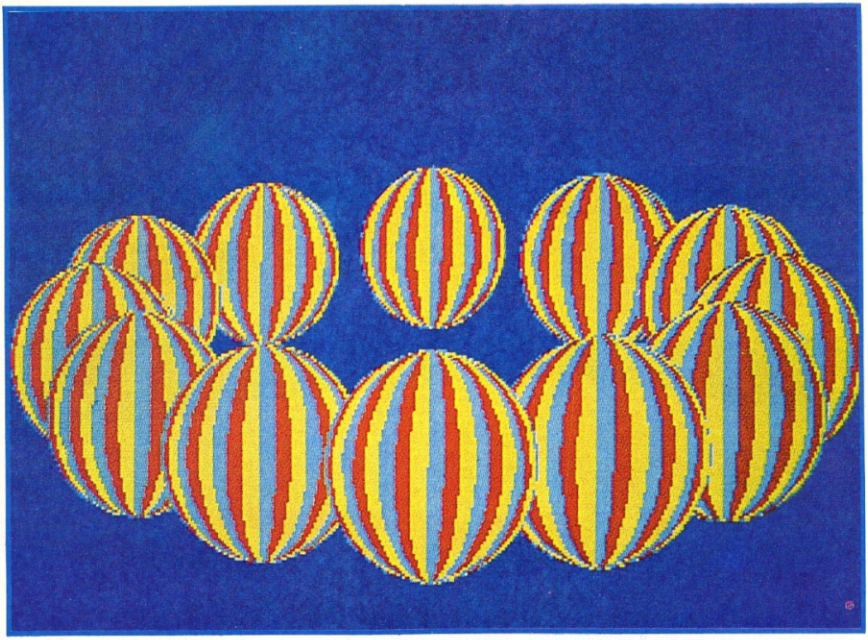


- Keywords continued
- Grappling with games
- Business & the Electron



AN ELECTRON COMPENDIUM

On the software front, the Electron is well-catered for albeit in an odd sort of way.

The Electron does have a good measure of software compatability with the BBC micro, though slight differences between the machines mean that not all BBC software will run.

The reason for this incompatability is that the Electron doesn't support Teletext Mode 7 — and many BBC program's title pages (if not the whole program) are written in Mode 7.

If it's just a matter of title pages, and the main program is written in any other BBC mode — you're lucky. It means that only the title page will appear as corrupted, while the rest should work.

If the program listing is in Basic then you should be able to LOAD it and modify the program by replacing the Mode 7 statements.

Acornsott — Acorn's own software house — had the jump on other software houses in producing packages to run on the Electron and has the following assortment in stock:

Creative graphics — This is software directly transferred from the BBC Micro and consists of 36 programs on cassette producing a range of pictures and patterns in colour. Some of the more notable are: recursively-defined curves, rotating three-dimensional shapes and brilliant landscapes.

A book also accompanies both the Electron and BBC versions of the program — written by John Cownie — giving screen shots of the creative graphics on-screen and explaining how they are developed (see the picture at the top of this page). It sells for £9.95 (and an extra £7.50 for the accompanying book).

Starship Command — One of the best strategy games for the BBC has also been 'ported over' to work on the Electron. As Captain of a battle starship, you have to 'fight off invading enemy spaceship — before going into combat, you are given a briefing on the facilities available on the battleship'. (See screen shot in Figure 1) Because joysticks are not yet available for the Electron, the program can be operated only from the keyboard — although it will handle joysticks when a joystick interface becomes available.

The main screen of the game is taken up by an outer-space scene featuring enemy ships, stars and (of course) your battleship. But the more unique aspect of this game is the 'status panel' on the side, which includes a long-range scanner, a short-range scanner, and 'accelerometer' showing how quickly you're changing speed, a rotation meter, a bar chart to show the state of the ship's energy banks, a shield 'mode-indicator' (whether they're on or off) and box to tell you which mission you're on. The game will cost you £9.95.

Draughts & Reversi — These are both traditional board games that sell as packages from Acornsoft. (See screen shot, Figure 2). The rules to both these age-old board games are briefly and competently explained in the documentation with the program package.

The board for each game is displayed on-screen as an eight by eight grid of checkered squares.

You can play Draughts at eight different levels of skill (Level 1 is the simplest level) and choose whether you or the computer goes first. The Reversi game offers the same choices, (though skill levels goes up to nine, rather than eight).

Moves (unless you have a joystick interface) are entered from the keyboard with the row number followed by column number. So to move a piece from Row 5, Column 2 to Row 4, Column 3 you would enter the numbers 52 and then 43 — and then the program would automatically move the pieces around.

The program costs £9.95.

Monsters — A traditional Apple program called Apple Panic was transferred to the BBC some time ago and has now been moved over to the Electron. (See screen shot in Figure 3).

You are placed in the rather nightmarish position of being stuck in a labyrinth of ladders and brick work being chased by monsters that still look suspicously like Apples with legs. In order to rid yourself of this threat to life and limb, you have to 'dig ' holes in the brickwork and smash the monsters through the holes in order to eradicate them.

Monsters can also be hit by causing other monsters to fall on top of them from above. However, great care must be taken in digging your holes because if a monster falls in a half-filled whole, he can crawl out and get downright mean with you.

There are several levels of monster-meanness. The Red monster meanies have to be pushed through only one level to perish, the Green monsters must fall two levels and the infamous White must fall a full three levels before they bite the dust.

Monsters costs £9.95.

Meteors — Another familiar arcade friend (asteroids) arrives for the Electron under the pseudonym of Meteors. (See screen shot in Figure 4). You control a ship that starts life at the centre of the screen and must avoid the meteors hurtling about you by dodging and blasting them.

And if you find you don't have a means of blasting your way out of a meteor shower, there's always hyperspace — which randomly lands you in the middle of almost anywhere.

You have to clear all the meteors before going on to the next screen. You start with three ships, but can attain an extra one every time you get 1000 points. The game costs £9.95.

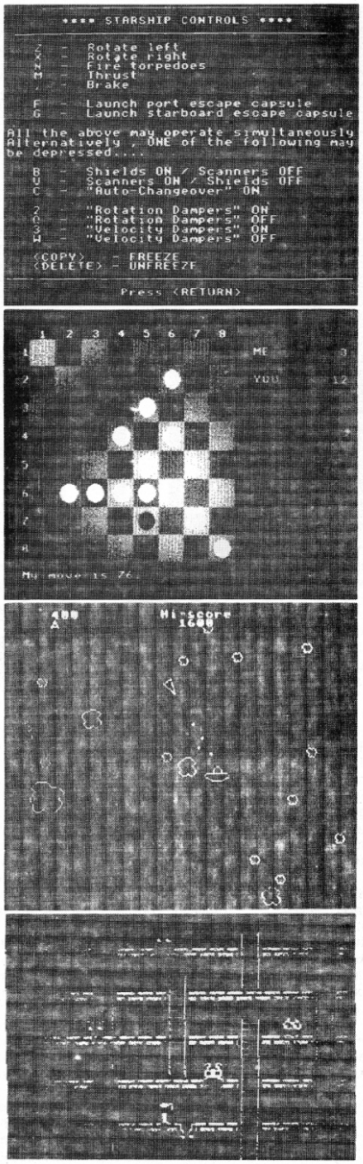
Electron programs are currently only available on cassettes. But that's expected to change soon — with the planned introduction of disk drives and cartridge software for the machine.

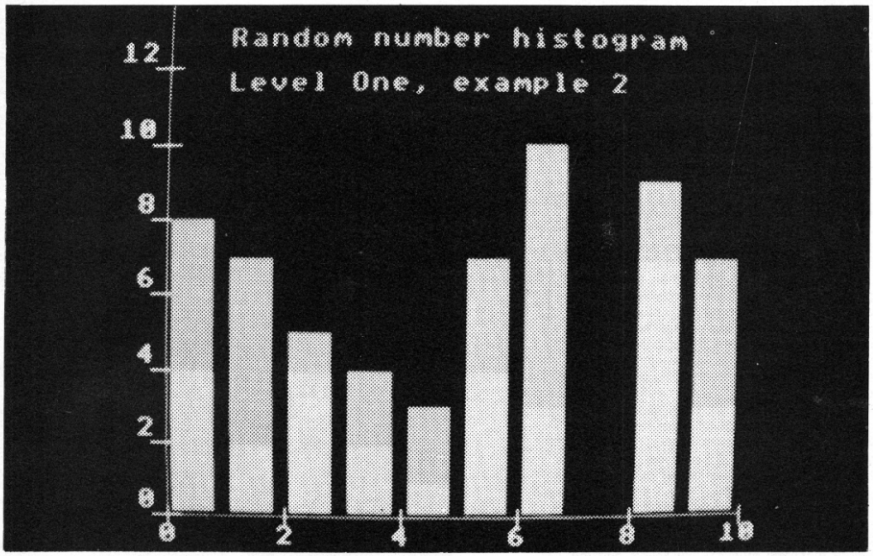
Cartridge software will allow you to load software almost immediately by plugging a cartridge straight into the Electron. The software in a cartridge is embedded on a chip, which is activated the moment you turn your machine on and thus accessible much faster than slow-loading cassette programs.

Disk software will, of course, only be available when disk drives are ready for the Electron. If the disk system is anything like that produced for the BBC Micro it will run either 80-track or 40-track disk software.

Disks run much faster than cassettes.

The release of cartridges is predicted for late spring, with the disk interface probably not arriving until late summer or early autumn.





GET DOWN TO BUSINESS

A number of limited business packages are produced for the Electron — including a business graphics package called Graphs and Charts and a small planning program called Personal Money Management.

Graphs and Charts produces a set of graphic routines which can be incorporated into programs to present data graphically in a range of applications. (See the screen shot above for an example). The graphs include automatic scaling, labelling of axes, and use of colours.

Acorn has also included routines to draw two-dimensional graphs, three dimensional graphs, stereo pairs, two-dimensional and three-dimensional contour maps as well as bar and pie charts.

The program itself costs £9.95 and an accompanying book costs an additional £7.50.

You wouldn't know it to look at the Electron, but this little machine can take on a good number of small business jobs, including word processing and spreadsheets

Word processors

Although it may seem a rather specialised function, the Electron's capacity for word processing suggests that an Electron with a good W/P program and a printer could easily make the household typewriter obsolete. However, not too much will be made of the word-processing functions until a printer interface is made easily available for the machine.

In terms of its layout, the construction of the keyboard and the feel of the keys, the Electron (with the addition of a printer interface) could easily take the title for being one of the best suited word processors in its class.

The Electron's built-in 80 column screen capacity also gives authors of word-processing packages the ability to quite easily develop proper full-width screens to preview pages exactly as they will be sent to the printer and to easily switch between the 80 and 40 column modes. Even on a low-resolution PAL TV you can write a letter in the 40 column mode and then switch to 80 column mode to see what it will look like when it's printed out.

The Electron also has dedicated Delete and Copy keys, along with independent cursor control keys. The availability of these keys makes it easier to control the cursor and do minor editing with the minimum number of keystrokes. They also make word-processing packages easier to write.

Other business

Spreadsheets are a familiar enough application — comprising more or less an electronic ledger that does all the calculations for you.

Visi-Calc is the most famous and uses an ordinary spreadsheet-type format to allow you to design your own on-screen ledger system — though it may be a while before Visicalc is available for the Electron.

In fact, it's not hard to write a 'scatchpad spreadsheet' to show you a little about how spreadsheets work and what they do. (Figure 1).

When you RUN the program, you'll first be presented with a question mark. This is to get the name or 'label' of the first column.

When you've answered that question and hit RETURN, reply to the next three question marks in the same way and you'll soon see something looking like a ledger.

There are four columns — A, B, C and D — well as two rows (1 and 2) which can be addressed quite simply. Look at the print-out (Figure 2) of the spreadsheet in use and then we'll explain the program a little further in detail.

In the first 'frame' of our spreadsheet program, we answered each of the questions regarding labelling with the answers: COST, CASH, VAT and PRICE — representing cost, profit, value added tax and final retail price respectively. Each of these factors relates the value of two products for which we are going to arrive at a retail price.

In frame 2, we get our first look at the spreadsheet itself. The statistics for product number 1 can be read from left to right along Row 1 and the statistics for product number 2 can be read from left to right along Row 2.

To start with, all values are 0 — so to get anywhere we have to start filling them in. Values are filled in from left to right and from top to bottom. So the first question mark below the spreadsheet is asking what value we want for the entry at A1; in this case, we reply with £2.50 (representing the COST of product 1).

The second question mark is also replied to with £2.50 (representing a 100 per cent mark-up on product 1) at A2. When we get to the third question mark, things begin to get interesting — here we are entering formulae instead of numbers and they tell the program to assign A3 with a value equal to the product of A1 and A2 added together and then multiplied by the current VAT rate.

The same procedure is carried out throughout the second set of question marks.

With the program's thirst for information satisfied the Electron's screen magically clears and a revised spreadsheet appears with all the numeric values handily caculated for you — showing the amount of VAT in boxes C1 and C2 and the final retail price in boxes D1 and D2.

The hard work in this spreadsheet is done mainly by the Basic keyword EVAL — which takes the formulae we entered after the question marks and works out the values for each of them. If EVAL finds out, however, that you've given it an expression which can be EVALuated, the spreadsheet will crash. In a full 'production' version of a spreadsheet program you would, of course, build in routines to have the program offer you a chance to correct your mistakes.

One other limitation in this very limited spreadsheet is that you can refer only to 'boxes' that have already been given values. If, for example, we entered the value B1*C1 in the box for A1 and then entered 6 and 4 respectively for B1 and C1 — the program would not produce 24 as the value for A1. The reason for this is because the program works through the boxes sequentially.

So, when the program comes to A1 and is asked to give it a value of B1*C1 — it will be 'confused' because you haven't yet stated what B1 and C1 are. The only option is to take the 'old' values for B1 and C1 and use them to produce a result, and if you've only just RUN the program, those values will be zero.

Figure 1

```
10 MODE 4
20 A1=0:B1=0:C1=0:D1=0:A2=0:B2=0:C2=0:D2=0
25 INPUT A$,B$,C$,D$
30 CLS
40 PRINT "     A","     B","     C","     D"
50 PRINT "
          "
55 PRINT "  ";A$,"  ";B$,"  ";C$,"  ";D$
60 PRINT "
          "
80 PRINT "
          "
90 PRINT "1    ";A1,"     ";B1,"     ";C1,"  ";D1
100 PRINT "
          "
110 PRINT "2    ";A2,"     ";B2,"     ";C2,"  ";D2
120 PRINT "
          "
130 PRINT "
          "
140 PRINT "
          "
150 INPUT A1$,B1$,C1$,D1$,A2$,B2$,C2$,D2$
160 A1=EVAL(A1$):B1=EVAL(B1$):C1=EVAL(C1$):D1
=EVAL(D1$):A2=EVAL(A2$):B2=EVAL(B2$):C2=E
VAL(C2$):D2=EVAL(D2$)
170 GOTO 30
```

Figure 2

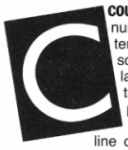
```
FRAME 1     FRAME 2
?COST            A          B          C          D
?CASH
?VAT          COST       CASH        VAT      PRICE
?PRICE
                1   0          0          0          0
                2   0          0          0          0
                ?2.5
                ?2.5
                ?(A1+B1)*.15
                ?A1+B1+C1
                ?76
                ?50
                ?(A2+B2)*.15
                ?A2+B2+C2
FRAME 3
     A          B          C          D
  COST       CASH        VAT      PRICE
1    2.5        2.5        0.75       5.75
2    76         50         18.9       144.9
```

KEYING IN THE RIGHT WORDS

COS — gives the cosine of an angle using the syntax COS(x) where x is the angle. The program below allows you to to draw a cosine wave.

```
10 MODE 4
20 FOR X=0 TO 1280 STEP 4 30 DRAW x,
500+500*COS (X/50)
40 NEXT X
```

The first line sets the screen Mode, Line 20 determines the 'step size' between the points to be plotted, Line 30 draws a point on the wave and Line 40 sends the Electron back for the next point on the wave.



COUNT — counts the number of characters 'printed' on screen since the last carriage return. In the example program below, you enter a line of text, then see that same text printed out on screen in colour with the number of letters in the text printed alongside. Here's the program:

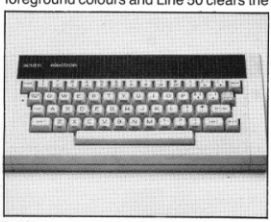
```
10 MODE 3
20 INPUT LINE Q$
30 MODE 2
40 COLOUR 3: COLOUR 129
50 CLG: PRINT Q$;" "; COUNT-1
```

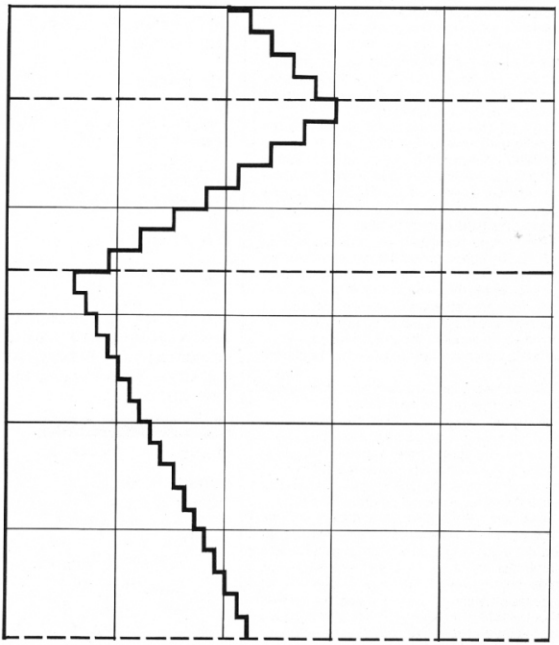
Line 10 sets the mode in which the characters will be input — in this case, Mode 3, the 80-column mode.

Line 20 gives the instruction to prompt you for a line of text.

Line 30 changes to a graphics mode so that colours can easily be used.

Line 40 assigns the background and foreground colours and Line 50 clears the graphics screen and prints out what you entered along with the number of characters in it. Note here that you're asking it to print out COUNT-1, because the space between Q$ and COUNT would be counted as an entered character if you didn't.





DATA — this word goes hand-in-glove with the READ instruction. DATA gives the information (or data) that a program needs to execute a particular task and READ allows the program to read that data.

A program using a DATA statement looks something like this:

```
10 DIM X$(5)
20 FOR N=1 TO 5
30 READ X$(N)
40 PRINT X$(N)
50 FOR Q=1 TO 200:NEXT Q
60 CLS:NEXT N
70 END
80 DATA This, is, your, demonstration,
text
```

Line 10 dimensions an array that will have five elements or pieces of data in it.

Line 20 sets up a FOR . . . NEXT loop that will begin the process of reading the five pieces of data into the program.

Line 30 reads in the data, starting at X$(N) — the first piece of data — and ending with X$(5) — the last piece of data.

Line 40 prints that data on the screen.

Line 50 employs a FOR . . . NEXT loop as a 'pause' device to keep the display of data on screen long enough to read.

The Electron keywords can be accessed directly from keys when they're used in the function mode. You can see the keywords on the keys in the picture above.

Line 60 clears the screen and gets the next piece of data.

Line 70 marks the end of the main portion of the program.

Finally, Line 80 contains the DATA statement and the data which will be printed out on screen. The five items in the DATA statement are READ from left to right so that X$(1) would print the word 'This', X$(2) would print the word 'is' and so on until X$(5) prints the word 'text'.

When RUN, the program prints the five words in the DATA statements and then clears the screen before printing them again.

DEF — this is an important word in BBC Basic — essentially, it labels a bit of programming within the main program so that it can be 'called up' when needed. Given that many operations in a program need to be carried out repeatedly the ability to call on such operations with a few simple Basic keywords is invaluable. For more details on this word and some program examples, see the discussion of ENDPROC further on.

DELETE — deletes from one line to another or deletes a single line. For example, the command:

DELETE 0,200

would delete all the lines in a program between Line 0 and Line 200 while the command:

DELETE 200

would simply delete Line 200. Single line deletion can also be performed by just typing the line number you want to delete and then hitting RETURN, so to delete Line 200 you would just type "200" and then hit RETURN.

DIM — tells the computer how much memory to set aside in a program for how many elements. The program used in discussing DATA is a good example of how arrays are dimensioned. You'll see at its beginning how you can set aside memory for five elements right at the beginning of the program.

Always make sure when you are dimensioning an array, that you do it at the start of the program — because if you try to refer to elements in an array that you haven't yet defined you will be in trouble.

FOR . . .

TO . . .

NEXT . . .

STEP . . .

The words FOR, NEXT and STEP are all connected in BBC Basic on the Electron. The word FOR is followed by a set of values from one value TO another for a variable (i.e. FOR X=1 TO 10).

The optional word STEP can then be used to specify the jumps in which values of X should occur. (i.e. FOR X=1 TO 10 STEP 2). If no STEP size is specified, the STEP is assumed to be zero.

After the words FOR . . . TO and STEP, a series of actions involving the variable X (i.e. PRINT X) are keyed in, and then the word NEXT ends up the whole thing by telling the program to go back and get the next value for X (i.e. NEXT X).

DIV — is a method of dividing two numbers and ensuring that their results will always be a whole integer. This can be very important when the result of a division *must* be whole (as in a COLOUR number, SOUND variable or DIM variable).

DRAW — draws a line from the previous co-ordinates of the graphics cursor to new ones. DRAW uses parameters from 0 to 1279 on the X-axis and 0 to 1024 on the Y-axis.

Looking again at the bit of animation and movement used in the examples to illustrate CLS and CLG (last week), you'll see that by using the DRAW command, you can change what had been a rectangle into a square and make the square 'grow' in size as it moves. Here's the program to do it:

```
5 MODE 5
10 FOR X=50 TO 250 STEP 25
20 MOVE X,X
30 DRAW 4*X,X
40 DRAW 4*X,4*X
50 DRAW X,4*X
60 DRAW X,X
70 CLG
80 NEXT X
90 GOTO 5
```

ELSE — is one of those words you'll never give up once you've used it. The ELSE condition is a further test for the IF . . . THEN . . . construction, where ELSE is the third and last part of that statement. A typical example of this word's use would be in testing for a yes or no answer to a question asked by a program.

You would use an INPUT command to get the answer string, but once that string is in the machine's memory, you would have two ways of testing the condition. Without the ELSE statement, you would have to write something like this:

```
10 IF X$="Y" OR X$="y" THEN PRO-
Cend
20 IF X$<>"Y" OR X$<>"y" THEN
PROCbeginning
```

But with an ELSE condition, you could simplify things so that only one positive choice has to be made by the player: if they don't choose a 'yes', answer with an upper or lower case "Y", then the answer is taken as a 'no'. To do this with an ELSE statement, you would write the following:

```
100 IF X$="Y" OR X$="y" THEN PRO-
Cend ELSE PROCbeginning
```

A good deal simpler, isn't it?

END — again, this statement was used in the earlier DATA example program. It serves the simple purpose of signifying the end of a program — which may appear a redundant task at first glance, but is often quite helpful.

In the DATA example, you'll note that the END statement comes before the line of DATA. This is because the READ instruction has already jumped down to the DATA statement, so all the work of the program has been done and were it allowed to continue on to the DATA statement again, it would merely get confused. The END statement is needed to signify the END of all the 'action' in a program.

The END statement is also important when employing procedures as it 'flags' the end of a series of procedure calls and prevents the program from moving on to the procedures after the END statement.

ENDPROC — this word does much the same job as END except that it's specifically for use at the end of a procedure. ENDPROC looks like this when used in a program:

```
4000 DEFPROCfornext
4100 FOR X=1 to 10
4200 COLOUR X
4300 PRINT "Hello"
4400 NEXT X
4500 ENDPROC
```

With that procedure sitting at line 4000 and another procedure at perhaps Line 5000, the ENDPROC statement is very important in finding the end of a procedure. If that ENDPROC statement had, for example been put at Line 4350 — *before* the NEXT X statement — the procedure simply wouldn't have worked because the NEXT X would have been outside the procedure and ENDPROC would have stopped the program from getting to Line 4400.

But with the ENDPROC statement placed properly, it allows you to create all kinds of little 'jobs' within a program that can be called up whenever you need them.

If, for example, you wanted to call up the procedure defined in the example above you'd need only to type PROCfornext and the program would jump to the procedure defined by DEFPROCfornext at Line 4000 and then execute that procedure. When the procedure was executed, the program would move back to the statement after the PROCfornext call.

Micropaedia Editor: Geof Wheelwright
Design: Nigel Wingrove
Credits: Some portions of this Micropaedia are extracted from a forthcoming *PAN/PCN* book on the Electron.

NEXT WEEK

We turn our attention to Electron peripherals and finish up our look at keywords. This will include a peek at what the future might hold for Electron add-ons as well as how you can best use cassette recorders.

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David Janda looks at a cassette based 64 Basic compiler.

Go faster with DTL

Finding a 'true' compiler for your micro can be a little difficult. Not that there isn't an abundance of them.

Usually, you will find that there are a few restrictions in use; no floating point, no arrays, no string handling etc. Many also require the compiler to be present in memory when the object code is run.

The Commodore-64 is no exception, and a disk based version called DTL-Basic 64 has been available for some time. Now DTL-Basic 64 is available on cassette for the majority of 64 users, and even though it offers a subset of the facilities of the disk based compiler, it still offers the 64 users a very powerful compiler.

Features

The main feature of this package is the total compatibility with Commodore Basic 2, thus allowing many (if not all) existing programs to be compiled. The only restriction is that the source code cannot exceed 12K because the tape version doesn't have the facility to 'pull in' bits of code and compile them.

Still on the theme of compatibility, DTL-64 allows the use of cartridge software or other utilities to be used with compiled programs. When compiling, a warning message appears to let you know that the DTL-64 compiler has come across a statement that it doesn't understand. This means that you could write and compile programs that use Simon's Basic for example, but the extra statements wouldn't be compiled. Instead, when the object code is run, the cartridge software or whatever 'cuts in' and takes over until the statement has been executed and then passes control back to the program.

This compatibility has been possible partly because the DTL-64 stores variables and arrays in the same format and place in memory as the interpreter. The only difference is that the variables are created in the order that they appear in the program, unlike the interpreter where they are created as they are first referenced.

Speed is an important factor in different types of program. DTL-64 offers a speed improvement from 10 to 15 times depending on the type of program.

DTL-64 allows you to specify integer variables like the interpreter. But the difference here is that the compiler has separate routines for integer and floating point calculations. Commodore 64 users rarely specify their variables as integers (there being no speed improvement) so the DTL compiler allows you to specify what variables are going to be integer or floating point by declaring said variables in a compiler directive. This saves going through the listing to edit variable names. Also, control variables in FOR . . . NEXT loops can be declared as integer, and this allows for a dramatic speed improvement.

One of the handiest features in DTL-64 is the special poke mode. This allows you to poke a value into an address. You switch on special mode as a compiler directive. Then, a statement such as Poke 3,23 will actually poke address 3 plus the value in the address with 23. This is handy as the compiler allows integers to a value of 16384 (usual), and the sound and graphics chips have addresses higher than this.

Finally, from the compiler itself, several compiler directives are allowed which can do things like disabling the break key and disabling the warning messages.

Documentation

As manuals go, the DTL-Basic 64 offering is not bad at all. What was missing was a 'what do I do if things go wrong' section, which would have been very handy as the compiler is not the easiest to use.

In use

Although the compiler should work with most Basic programs, any additions or amendments should be made before using the compiler. This is because you cannot fiddle about with your source code once it has been loaded into memory by the compiler. Indeed, once you have compiled the program and errors have cropped up, you can't amend them in memory at all! Instead, it's necessary to exit the compiler, load and amend the source code, save it, reload the compiler, reload the amended source code and then compile it.

After the source code has been prepared and saved to tape, you then have to go through the long process of loading and running the compiler which is in three parts.

To keep the compiler at a fairly reasonable price, Dataview issues a security key (dongle) which is inserted into the cassette port after the run time library has been loaded. The space key is then pressed, and if the security numbers match, you can reinsert the cassette cable and proceed.

In practice, things were not as simple as that. The dongle is not a very secure fit and there is no polarising notch on it, so it is easy to insert it the wrong way.

Normally, improper insertion of the dongle will result in the 64 resetting, but, if like me you insert it too far and at an angle, the Commodore 64 could (as mine did) pack up completely.

Commodore constantly repeats in its documentation that nothing should be attached or detached while the power is on as damage may occur and I agree.

After the key has been fitted and all is well, a menu of options is displayed and you can choose to use the printer to give reports on compilation as well as a listing with error reports, if any. The names for the source and object code are entered in lower case.

After the source and object files have been specified, you load the source code and compile it. The compiler gives two passes of the code and the line number which it is working on is displayed on the screen together with the pass number. Warning and error messages are also displayed and if the option to use the printer was chosen, a headed listing is generated with the error and warnings placed in the offending part of the code.

The compilation time is quite fast and at the end the compiler warns you that it is going to save the object code to tape. After that you have the choice of compiling another program, or to rewind the tape, load and run an already compiled program. Here there should have been an option to dump the RTL file immediately after the object code to produce a totally free running program. As it is, it is necessary to save the object code, take the cassette out, insert the compiler tape and load the RTL file, reinsert the object tape and save the RTL file after the source code!

Verdict

The compiler produces object code which can run many times faster than ordinary Basic. The fact that there is very little amending to the existing program means that with a few minor adjustments you can compile your existing library of programs without the necessary adjustments to the source code as some compilers require.

The fact that compiling programs is a very long and user-hostile process, makes what is an excellent compiler a bore to use and the user interface could be dramatically improved. A rethink into using dongles on cassette ports while the machine is on should also be considered.

The tests

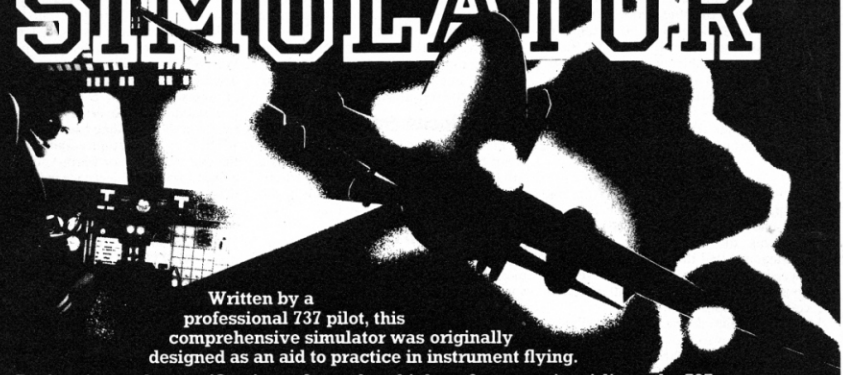
The DTL compiler offers several compiler directives which allow you to specify integer variables and so on. This can increase the speed of the program, but you can't use the integer directive throughout the program. The break key disable option doesn't make much difference as it is tested after a NEXT as well as an IF statement.

Name DTL-Basic 64 **System** CBM 64 **Price** £34.75 **Format** Cassette **Publisher** Drive Technology Ltd **Outlets** Dataview (0206-869414)

BENCH MARK TIMINGS

	BASIC	COMPL	INTGR	BRKON
BUBBLE SORT	98.30	39.61	16.28	16.21
SELECTION SORT	41.66	15.05	7.10	7.01
INSERTION SORT	57.83	19.56	8.65	8.61
QUICKSORT	15.81	4.20	1.98	1.98
REAL	113.01	107.56	107.93	108.00
PRINT/SCR	2.43	2.13	1.60	1.60

737 FLIGHT SIMULATOR



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Three new text printing packages for Spectrum 16K or 48K are reviewed by Ted Ball.

Meeting new faces

Design with Dlan

Business applications for computers don't have to be boring things like accounts and stock control. Dlan, for the 16K or 48K Spectrum, is a simple programming language producing colourful, animated advertising displays with text in various sizes and typefaces.

Features

With Dlan you design the displays with rectangular windows on the screen. The windows may be any size up to the full 24 by 32 screen size and may overlap, and you can use any of nine decorative borders around them. As your text is printed it scrolls into the current window from the bottom and you can later scroll the windows independently in any direction.

There are 11 different typefaces in the 48K version, but only four in the 16K version, and the sizes vary from the normal Spectrum character size up to three times as high and double the width. You can use all the colours available on the Spectrum, and also the bright/dull and flashing/steady attributes.

The language consists of 31 single-character commands you enter into Basic REM lines, and you can use the Basic editor in the usual way to alter your program.

Presentation

The cassette comes in a box with an insert that seems to have been designed with Dlan. The tape is recorded on both sides, with a demonstration program and the 16K and 48K versions of Dlan on each side.

An eight-page booklet explains the commands and how to use Dlan, and gives hints on using the program for effective displays.

In use

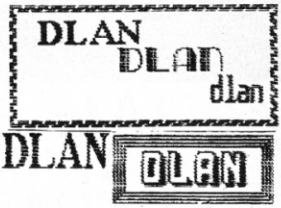
Dlan is simple to use and easy to set up, with the help of the instruction booklet. It's commands are executed one at a time in the order they appear in your program and you can build up your display a little at a time, testing it as you go.

The main problems you are likely to have are due to the lack of error messages. If you put invalid commands in your program Dlan will generally ignore what it does not understand and continue with the next command. For this reason it can be difficult to discover why the display is not coming out the way you want. For example, if you try to print characters that are three lines high in a window two lines high you will just get a blank window with nothing to tell you why.

A suggested use for Dlan is to produce fancy labels on the ZX Printer, but the Basic copy command only sends the top 22 lines to the printer. Dlan does not include a command to copy the full 24-line screen although this is easy to implement.

Reliability

It is almost impossible to crash Dlan because it ignores incorrect commands. The only way I found to make it go wrong was to include a Basic line not beginning with REM, and even then the worst that happens is you drop into Basic with your program intact.



Verdict

Although you may have problems because there are no error messages to tell you when you have done something wrong, Dlan is a simple language, easy to learn, but still very effective for producing animated text displays.

Product name Dlan **Application** Animated text display **System** Spectrum, 16K or 48K **Price** £7.95 **Publisher** Campbell Systems, 15 Rous Road, Buckhurst Hill, Essex IG9 6BL **Format** Cassette **Language** Machine code **Outlets** Mail order.

RATINGS

Features	
Documentation	
Performance	
Usability	
Reliability	
Overall value	

Microprint moves matter

The text printing capabilities of the Spectrum can also be extended with Microprint 42/51 this time in the direction of packing more text onto the screen or using different typefaces for emphasis.

With Microprint you can get 42 or 51 characters to a line as well as the usual 32, giving up to 1,224 characters on the full 24-line screen.

You can use it from Basic by setting up variables for the text to be printed, the print position, the colour and other attributes, and printing the text by a USR command, or from machine code, by setting up the details in specific addresses and calling the Microprint code directly.

Microprint provides a machine code subroutine to use in your own Basic or machine code programming, and the instruction sheet gives details of how to use it. However, you need to be proficient at programming to make real use of it.

You can get effective displays with Microprint by mixing the three text sizes, but although it allows you to use all 24 lines of the screen with the two extra character sizes, you cannot use the bottom two lines of the screen for normal size characters. And it does not let you LPRINT the extra Microprint 42/51 is a useful machine code subroutine you can use from your own programs to produce text displays. The three different text sizes available with Microprint allow you to fit more text onto the screen and to use different typefaces.

Product Microprint 42/51 **Application** Text display **System** Spectrum 16K or 48K **Price** £5 **Publisher** Myrmidon Software, PO Box 2, Tadworth, Surrey KT20 7LU **Format** Cassette **Language** machine code **Outlets** Mail order

RATINGS

Features	
Documentation	
Performance	
Usability	
Reliability	
Overall value	

Multifont printing

A third text printing for the Spectrum Multifont, which gives six typefaces for text printing in Basic or machine code programs.

Four of the fonts give new upper case letters, numerals and the symbols up to ASCII code 90, the other two give full character sets.

To use the new typefaces you load any or all of the character sets as CODE, and to select a typeface you POKE the system variable UDG as described in the instructions.

Product Multifont **Application** Text display **System** Spectrum 16K, 48K **Price** £4.95 **Publisher** Image Systems, 185 Elm Road, New Malden, Surrey KT3 3HX (01-942 7138) **Format** Cassette **Language** Basic **Other versions** None **Outlets** Mail order.

RATINGS

Features	
Documentation	
Usability	
Overall value	

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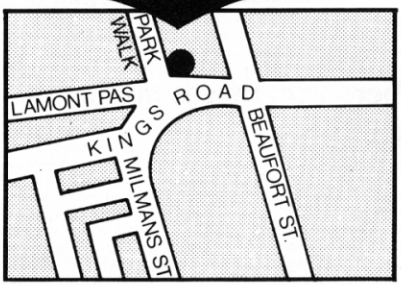

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DRAGON 32

Devil's children

Name Devil Assault **System** Dragon 32, 1 joystick **Price** £8.00 **Publisher** Microdeal, 41 Truro Rosad, St Austell, Cornwall **Format** Cassette **Language** Machine code **Other versions** None **Outlets** Mail order/retail.

Is it possible for a variation on that old Invaders/Galaxians theme? If you have imagination, it is, and American programmer Ken Kalish, author of this and earlier Microdeal games, certainly does.

Objectives

Placed at the foot of the screen, you have to survive waves of aliens, including the Devil himself, to clock up the mega-galactic ultimate high score.

In play

As with most Microdeal games, you're given the option of three background colours; make a note of your choice as there's no way of changing apart from reloading. Nor is there any way of changing the skill level you've chosen from the five on offer. Minor complaints apart, this is an excellent and fast arcade game.

The first aliens are a wave of bombing birds: each time you kill one its replacement rushes in on a hurricane of sound and graphics. On higher skill levels, as each bird is hit it splits.

If you thought Galaxians were adept at herding you into a corner for the kill, then you ought to see the robots. For survival stay near the centre of the screen and try to pick them off, dodging the bullets; if you stray too far, they home in and get you.

After the Robots come the Sproings, aptly named because they slide down the side of the screen out of laser range, and then sproing about the screen at varying heights. On killing the Sproings, you go back to the start of the cycle, only naturally it's worse.

On harder skill levels, the Devil puts in an appearance on the bombing waves. When he gets to the centre of the screen he drops a fire-bomb, either shoot the Devil or hit the bomb, otherwise it devastates a part of the base, which traps you in one-half of the screen, an easy target for the birds. Hitting the bomb once released is tricky as the birds flutter round it firing bullets.

The graphics on Devil Assault are excellent, the speed and complexity will present a problem to anyone who enjoys a fast-moving game.

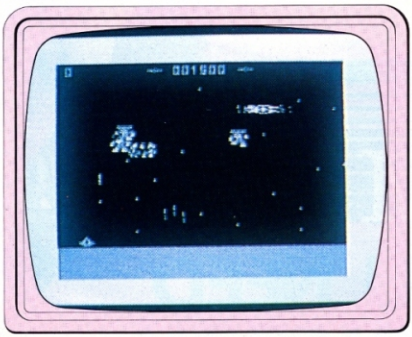
Verdict

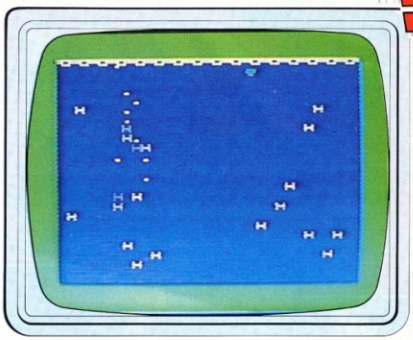
It's a pity you don't automatically move up a skill level as you go; I managed to score over 90,000 on the easiest level and was praying for some variety, but though not quite perfect Devil Assault is still a devil of a game.

Mike Gerrard

RATING

Lasting appeal:	
Playability:	
Use of machine:	
Overall value:	





Formula one

Name Wasps + Dragon Racer **System** Dragon 32, joysticks **Price** £9.99 **Publisher** Cable Software, 52 Limbury Road, Luton LU3 2PL **Format** Cassette **Language** Machine code **Other versions** None **Outlets** Mail order.

A Christmas twin pack from Cable Software offers a zap-em down game, plus a car race.

Wasps

Wasps is a Space Invader type program, without too much of a sting. This machine code program is very fast and well-written, but apart from killing off wasps, the program doesn't offer a great deal.

Four ships defend your planet, while the wasps bomb your bases. As I hate wasps, I liked the sound effects for a dead wasp best of all — a kind of frazzle sound.

So with the first screenful wiped out, the next swarm move in. Failure to kill the wasps means they land on your planet and eat your base.

At the end, your score is displayed, along with your Commander status — over 65536 and you're on level 1.

A high score chart would have added just that little bit extra.

Verdict

The program does show what a Dragon can do in machine code, and sold alone would have been good value.

Dragon Racer

Dragon Racer was very much a let-down. The aim is to travel without going out of control and crashing, or blowing up.

Drawn in hi-resolution graphics (black and white), half of the screen is devoted to numeric information (speed, gear, revs) and the track is a narrow strip down the screen's centre.

You'll need both joysticks to move. One acts as the gear box, the other is your brake/accelerator and steering. I found it hard to master both joysticks, let alone read the dashboard. The maximum speed is a flickering display — on the highest level it was like trying to read a numeric stopwatch.

Eventually, I got moving — slick, fast gear changes are needed to avoid blowing your engine — and chugged along at 50 mph. Then just like on the M1, some idiot appears behind, if you don't move out of the way, he'll just go straight into you.

The higher your level, the faster you travel, curiously, on the toughest level, I made the best progress.

The sound is good, but I would have preferred to have sound only when moving, and not all the time.

Verdict

As so little of the screen has been utilised, a system of dials or some other form of visual display would have added to the program. After all, if it can be done on flight simulators, then why not on Formula One?

Jim Ballard

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

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COMMODORE 64

Citizen cool

Name Siren City **System** Commodore 64 **Price** £7 **Publisher** Interceptor Micros, Lindon House, The Green, Tadley, Hants. (07356) 71145 **Format** Cassette **Language** Machine code **Other versions** none **Outlet** Mail order, retail.

There are many games in the naked city. There are few where the city is in the game. This is just one of them.

Objectives

You cruise a patrol car around the city, endeavouring to keep the streets safe. Public enemies include homicidal dragster drivers, a bazooka-wielding helicopter pilot and sundry psychopathic motorists. More normal hazards like Sunday drivers, sharp bends and a railway engine present no less a threat to your peace-keeping role.

In play

A simple title page invites you to wait for a demo or press a key to start. You have a choice of levels from 1-10.

Instructions and progress are given by a teletype simulation — adding to the general 'police procedural' atmosphere though sowing things up between rounds.

The city is large, a jungle of roads, buildings, lawns, hoardings, fire hydrants and a railway running right down the centre. You have a bird's-eye view of the scene, the main item of which is your black and white patrol car.

Pushing your joystick (sorry, no keyboard option with this one) in the direction you wish to travel moves your car, picking up speed the longer the joystick is pushed. Slowing down is simply the reverse process. Turning left or right is accomplished by a quick flick of the joystick in the appropriate direction and a simultaneous press of the fire button. You can even execute smart U-turns and spins a la Hazzard County once you've got the hang of it.

As you motor around, the screen scrolls to reveal more of the geography — it turns out to be a fair-sized city. Depending on the level you've selected, your duties can range from a simple patrol of the streets until your timer runs out (try to avoid hitting motorists) to blasting an attacking helicopter, neutralising poisonous fumes, detonating timebombs and shooting killer dragsters. It's all in a day's work.

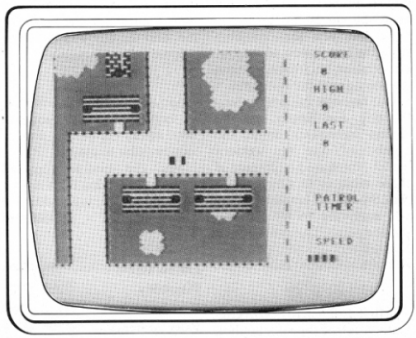
One of the best, though deadly, features of this program is a steam locomotive which hurtles down the railway line at erratic intervals — better not be dawdling across when it's due.

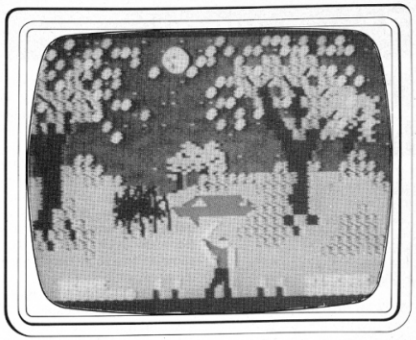
Verdict

With good use of sound and sprites and an impressively large but not so naked city, the game provides an enjoyable and testing romp. **Bob Chappell**

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	





It was no picnic

Name Forbidden Forest **System** Commodore 64 **Price** £11.95 **Publisher** Cosmi, USA **Format** Cassette **Language** Machine code **Other versions** None **Outlet** Home Computers, 234 Church Street, Blackpool FY1 3PX. (0253) 22340.

If you go down to the woods today, you're sure of a *big* surprise — the place is full of the grisliest ghouls you could ever wish not to meet. Forget about a walk in the Black Forest; in Forbidden Forest you'll be running — scared!

Objectives

Out for a little target practice with your bow and arrow, you become lost in a strange forest. Darkness falls and with it come the creatures of the night: giant spiders, killer bees, enormous frogs, fire-breathing dragons and worse.

You realise, too late to turn back, that you have wandered into Forbidden Forest, home of the dreaded Demogorgon and his ghastly gang. All that stands between you and a gruesome end is your prowess as an archer and your ability to break the four-minute mile.

In play

Those of a nervous disposition are advised to turn the sound down and to wear warm clothes while playing — this game has music to chill the spine and sound effects to freeze the blood. Some of the graphics are pretty gory, so you'd best close your eyes as well.

In the midst of the forest stands a large figure, the archer. One touch of the joystick button and the archer takes an arrow from the quiver and fits it to the bow, a second press and the arrow is fired.

Moving the joystick up and down sets the trajectory of the arrow which remains fixed in this position until you decide to alter it again. Pushing the joystick left and right turns the archer through 11 different firing positions; holding the joystick to the left or right sets the archer running.

Sinister chords announce the arrival of the first shocker — a giant, man-eating spider. You can try to outrun it or shoot it. You can't load your bow while on the run and if you haven't already done that by the time a spider is close, too bad — you'll end up as a spider's lunch (complete with dripping blood — ugh!).

Having disposed of four spiders, a loud buzzing heralds the killer bee, as big as a football and considerably more lethal. Then follow the jumbo frogs, a fiery, flying dragon, spear waving skeletons, a hooded phantom, giant snakes and, last but not lovely (and accompanied by a violent storm), the demogorgon.

Verdict

The creepy music, heart-thumping sound effects and colourful animation make this a truly exciting game. If your adrenalin hasn't had a good run lately, treat it to this.

Bob Chappell

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

VIC 20

Mixed batch

Name Survival **System** Unexpanded Vic20 **Price** £5-99 **Publisher** Avalon Computing, 14 Cliff Road, Hornsea, North Humberside HU18 1ll **Format** Cassette **Language** Basic **Other Versions** None **Outlet** Mail order

At £1.20 each the programs on this cassette are not only very cheap, but also of low quality.

Objectives

In all five games the object is to survive. Hence the name. From the descriptions of each of the games, they all sound phenomenal. The survival objective is, needless to say, eventually impossible. It's only really a question of how long you can stick it out. Just like life, in fact.

In play

Opening the bill is *Mazeman*, a variation on the gobble up the dots theme, but a rather turgid one, and nowhere near the excellence of versions for the expanded Vic.

Bomber is the next to appear on the screen, and is almost a direct copy of a version I first saw four years ago. Fly along, shooting the tops off tall buildings, and bombing anything beneath you. Rather like a modern day Dresden or Coventry (and as pointless), but a spectacularly boring game to play. After a few minutes I didn't really care whether I survived or not, which can't be the meaning of life, or can it?

Voyager, the next item on today's menu, is another rather dull game, and again a big disappointment after the description on the label. What would you think, confronted by 'Travel through an infinite universe dodging asteroids, collecting fuel, arms and supplies for your dying planet'? The game isn't that bad, but I'd been led to expect better, I felt.

Next to load up is *Terminal Termite*. Set in a deadly ant's nest, but it could be anywhere. There are two sentinels in each chamber, and you've only got 15 seconds per chamber. Actually it's rather tedious, but that doesn't come through so well in description.

To finish off both the cassette, and myself, comes the amazing blast-the-aliens-one-more-time *Rings of Titan*. Really, I ought to be impressed by this, but I'm not. It certainly doesn't inspire me enough to say anything more.

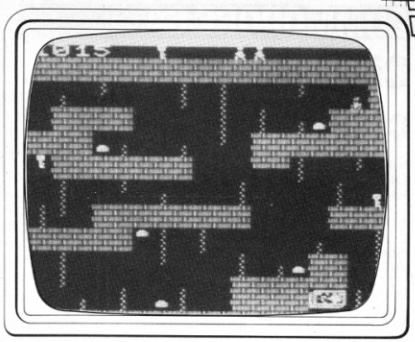
Verdict

I would have been considerably less disappointed if the public relations talk had been left off the cover. Things said to encourage you to expect great things should only be said if great things are coming. At £1.20 a game I suppose I shouldn't expect too much, but, partly because of the build up, I did.

Piers Letcher

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	



Save the city

Name Countdown **System** Commodore Vic 20 **Price** £5.50 **Publisher** Paramount Software, 67 Bishopton Lane, Stockton Cleveland. **Format** Cassette **Language** Machine Code **Other Versions** None **Outlet** Mail order and most dealers.

For those of you keen on helping governments out and preventing nuclear holocausts, this is definitely the game for you.

A mad scientist is holding the government to ransom with a massive explosive device which he's planted in the heart of the city sewerage system. Your mission, should you choose to accept it of course, is to defuse the bomb.

Objectives

However, life is made a little bit more complicated before you even start. The scientist kidnaps you and imprisons you in a large house in the jungle on the edge of town. Being the superhero that you are, escaping from the house was, of course, no problem, but from here on in it's you against the computer.

Get through the jungle, into the city, and finally into the sewers themselves, defuse the bomb and save the western world. You have a maximum of three minutes in which to do this, though the lunatics among you may care to try the two minute game. This is only to be recommended to potential Raiders of Lost Arks.

In play

The first problem to be solved is getting out of the surrounding security traps, so you must make your way past security devices and locked gates in order to reach the top of the screen and emerge into the jungle.

To open the locked gates you'll need a key, and these are dotted about the screen, usually inches away from some deadly security trap.

Once you've survived that one, you're in the jungle itself. Here, there are some very strange man-eating plants — to be avoided whenever their mouths open. When their mouths are shut you can run over the top of them, and you'll have to do that a couple of times to get through this level and into the sewers.

Then it's just a matter of running past a few deadly tendrils that move about unpredictably.

Here the joystick is probably not to be preferred, and for once an arcade game comes out better when you stick to the keyboard.

And if you escape the sewers? Who knows — I never got that far. A succession of poisonous tendrils got the better of me, and the city was blown to peices.

Verdict

Another game that uses the Vic 20 to the full, though you will need either 8K or 16K expansion in order to play it.

For the nimble fingered amongst you, this is an enjoyable and maddeningly addictive game.

Pete Gerrard

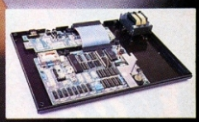
RATING

Lasting appeal	
Playability	
Use of machine	
Value for money	

Power to your Fingertips.

All keys on the FDS keyboard contain all the Graphic Characters of the ZX Spectrum

Microdrive interface 1 easily adapted to fit inside the case



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Based on the popular FD42 system, the Fuller FDS is simple to install; it requres no soldering or technical knowledge. For the user who is reluctant to install his computer circuit board inside the FDS, a buffer is available (£8.75 + 80p&p) which simply plugs into the expansion port and connects directly to the keyboard.

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2. Frogger *by Sierra On-Line.*

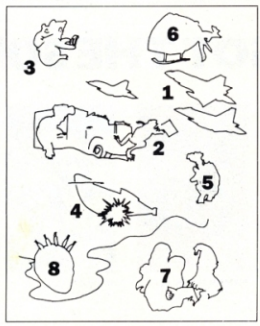
Now you're a frog stranded a long way from home. A perilous journey awaits you. Once across the busy motorway, a surging river full of logs, turtles and alligators awaits. Better flex those Froggy leg-muscles though, the bank is steep, so look before you leap!

3. KoalaPad Touch Tablet *by Koala.*

You can't overfeed this Koala — he'll make his own menu selections. He'll also move game players, make musical notes, draw computer graphics and much more. The KoalaPad Touch Tablet is an accessory that'll enhance the capabilities of your home computer system.

4. Sea Dragon
by Adventure International.

Take a deep breath — you'll need it to navigate your sub through a labyrinthian underwater passage to free the menace of the imprisoned Sea Dragon. Mines, electrifying eels and lethal laser beams await you in this murky underwater world. You've limitless torpedoes, but limited air, so hurry!



5. Turtle Graphics II *by HesWare.*

This Turtle's about to paint the town red. Or green. Or blue with pink spots. By teaching him to paint, draw and colour he'll teach you, painlessly and enjoyably, the basics of computer programming — maths, logic, communications and more with over sixty commands. Ideal for children from six to sixty.

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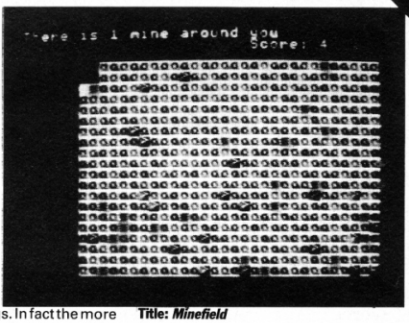
MINEFIELD



Title: *Minefield*
Machine: *BBC*
Application: *Game*
Language: *BBC Basic*
Author: *M Durrant*

If you have spent all day playing zap zap zoom whheeeoow type games and you're feeling a little shell shocked, this game from M Durrant, of Blandford, Dorset, won't cure you but it will give your space — legs a rest.

The object of the game is to find your way across the minefield from one corner (S) to the opposite corner (F). You are not shown where the mines are (of course) but you are told what mines are on the surrounding squares. Using this information as a clue you should be able to cross the field.

As you progress across the minefield there are bonus points to be gained by going through the flags. In fact the more you explore, before reaching the final destination, the higher your score will be.

Program notes . . .

20	Select the screen mode. Note that this program will run on an Acorn Electron if MODE six is selected instead of seven.
30	Execute the procedure Variables. This sets up some user defined graphics and of course some variables.
40	This procedure sets the scene for the game.
50	Select the screen mode to play in.
60	Display some more instructions and inform the player of the user defined graphics.
70	Here is where the mines are layed.
80	Flush (empty) the keyboard buffer.
90	Any key to continue prompt.
100	Get rid of the flashing cursor, OS 1.0 or above only.
110	Clear the screen.
120	Draw the playing screen.
130	Ignore the keys on the first go.
140	Get the next move from the keyboard.
150	Check the position to move to, if it is one then it is a block.
160	If it is two then BANG ouch!!
170	Check for the finish congratulations if you made it.
180	Check for the beginning.
190	Check for a flag and award some bonus points if reached.
200	If square is safe then mark it as such and update the score.
210	Rub out the current position marker.
220-230	Update player's position.
240-260	Work out the number of mines around the player.
270	Use the correct English.
280	Print up the current number of surrounding mines.

```
>L.
   10CLS
   20MODE7
   30PROCVariables
   40PROCInt1
   50MODE1
   60PROCInt2
   70PROCSetUp
   80*FX15,1
   90PRINTTAB(7,27)"Press any key to con
tinue":A$=GET$
  100VDU23;8202;0;0;0;
  110CLS
  120PROCDraw
  130GOTO150
  140PROCKeys
  150IFMF%(MX%+DX%,MY%+DY%)=1THEN140
  160IFMF%(MX%+DX%,MY%+DY%)=2THENSOUND0,
-6,10,10:PRINTTAB(1,1);"You hit a mine !
! Your score is ";Score%:GOTO800
  170 IFMF%(MX%+DX%,MY%+DY%)=4THENPRINTT
AB(1,1);"You made it ! ,with a score of
";Score%:PRINTTAB(MX%+6,MY%+3);" ":PRINT
TAB(35,23);CHR$255:FORN%=120TO200STEP10:
SOUND1,-15,N%,2:NEXT:SOUND1,-15,200,6:GO
TO800
  180IFMF%(MX%+DX%,MY%+DY%)=3THENPRINTTA
B(1,1);"You are at the beginning     ":PR
OCPause(2200)
  190IFMF%(MX%+DX%,MY%+DY%)=6THEN MF%(MX
%+DX%,MY%+DY%)=0:Bo%=RND(5)+5:PRINTTAB(1
,1);"You recieve ";Bo%;" Bonus points
    ":SOUND1,-12,100,2:Score%=Score%+Bo%
:PROCPause(1300)
  200IFMF%(MX%+DX%,MY%+DY%)=0THENScore%=
Score%+1:MF%(MX%+DX%,MY%+DY%)=5
  210PRINTTAB(MX%+6,MY%+3);" "
  220MX%=MX%+DX%:MY%=MY%+DY%
  230TX%=MX%-1:TY%=MY%-1
  240NM%=0:FORA%=0TO2:FORB%=0TO2
  250IFMF%(TX%+A%,TY%+B%)=2THENNM%=NM%+1
  260NEXT,
  270IFNM%=1THENE1$="is":E2$="" ELSE E1$
="are":E2$="s"
  280PRINTTAB(1,1);"There ";E1$;" ";NM%;
" mine";E2$;" around you   "
```

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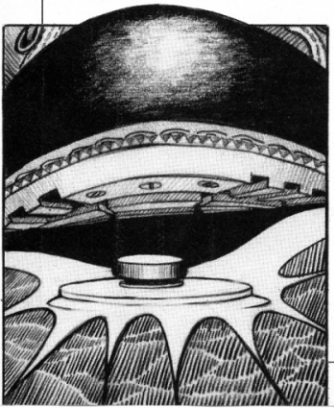
MINEFIELD

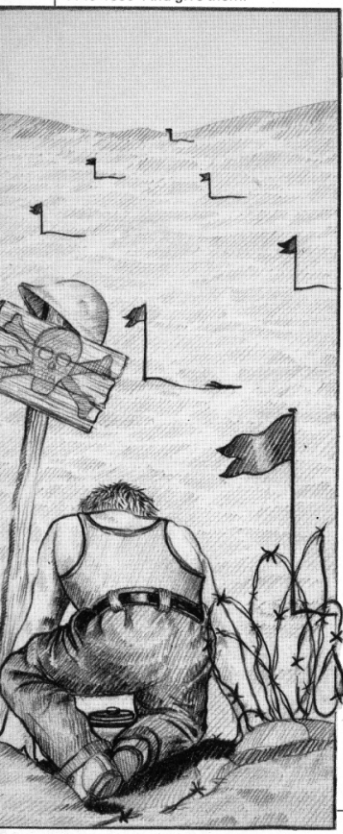
290	Reposition the current marker position.
300	Print the score.
310	Continue the game.
320	Procedure to scan the keys.
330	Clear the keyboard buffer.
340	Get the keypress.
350-380	Set the direction of movement depending on the keypresses.
400	Define a procedure to draw the mine field.
410-420	The field is 20 by 30.
430	If the minefield is clear or there is a mine then put the normal field character onto the screen.
440	Place a block on the field.
450	Place a flag onto the field.
460	Keep on drawing note the two nexts with the comma.
470-480	Put on the start and finish.
490-510	Print the top and bottom edges of the field in red. The pound signs are hashes.
520-530	Print the side edges.
550	Start prompt.
570	Print the player at the start position.
590	Define a procedure to lay the mines.
600-610	Again a 20 by 30 field.
620-650	By random numbers lay mines!
670	Set the start and finish locations to be OK.
680-690	Give the player a chance to start and finish.
710	Define a procedure to set up the user defined characters and the playing variables.
720-750	Define the characters.
760	Set the movement variables and the score.
770	Dimension the minefield array.
800	Pause.
810	Check for high score.
820-850	Prompt to see the mines and act on the reply.



```
  290PRINTTAB(MX%+6,MY%+3);CHR$226
  300PRINTTAB(24,2);"Score: ";Score%
  310GOTO140
  320DEFPROCKeys
  330*FX15,1
  340A$=GET$:DX%=0:DY%=0
  350DX%=(A$="Z")*1 + (A$="X")*-1
  360DY%=(A$=":")*1 + (A$="/")*-1
  370IF(MX%=1ANDDX%=-1)OR(MX%=30ANDDX%=1
)THENDX%=0
  380IF(MY%=1ANDDY%=-1)OR(MY%=20ANDDY%=1
)THENDY%=0
  390ENDPROC
  400DEFPROCDraw
  410FORA%=1TO30
  420FORB%=1TO20
  430IFMF%(A%,B%)=0 ORMF%(A%,B%)=2 THENP
RINTTAB(A%+6,B%+3);CHR$(224)
  440IFMF%(A%,B%)=1 THENCOLOUR2:PRINTTAB
(A%+6,B%+3);CHR$(225):COLOUR3
  450IFMF%(A%,B%)=6 THENPRINTTAB(A%+6,B%
+3);CHR$(227)
  460NEXT,
  470PRINTTAB(7,4);"S"
  480PRINTTAB(36,23);"F"
  490COLOUR1
  500PRINTTAB(6,3);STRING$(32,"#")
  510PRINTTAB(6,24);STRING$(32,"#")
  520FORN%=4TO23
  530PRINTTAB(6,N%);"#":PRINTTAB(37,N%);
"#":NEXT
  540COLOUR3
  550PRINTTAB(1,1);"  HIT ANY KEY TO STA
RT":*FX15,1
  560A$=GET$
  570PRINTTAB(7,4);CHR$226
  580ENDPROC
  590DEFPROCSetUp
  600FORA%=1TO30
  610FORB%=1TO20
  620IFRND(6)<>1THEN660
  630IFRND(1)<.25THENMF%(A%,B%)=1:GOTO666
0
  640IFRND(5)=1THENMF%(A%,B%)=6:GOTO660
  650MF%(A%,B%)=2
  660NEXT,
  670MF%(1,1)=3:MF%(30,20)=4
  680MF%(1,2)=0:MF%(2,1)=0:MF%(2,2)=0
  690MF%(30,19)=0:MF%(29,20)=0:MF%(29,19
)=0
  700ENDPROC
  710DEFPROCVariables
  720VDU23,224,255,195,165,153,153,165,1
92,255
  730VDU23,225,255,213,171,213,171,213,1
71,255
  740VDU23,226,255,255,255,255,255,255,2
55,255
  750VDU23,227,96,88,70,88,96,64,64,64
  760MX%=1:MY%=1:DX%=0:DY%=0:Score%=0
  770DIMMF%(31,21)
  780 H%=0
  790ENDPROC
  800FORN=0TO3000:NEXT
  810IFScore%>H%THENH%=Score%:COLOUR3:PR
INTTAB(1,1);"A NEW HIGH SCORE OF ";H%;"
          "
  820PRINTTAB(1,1);"DO YOU WISH TO SEE T
HE MINES ??     "
  830*FX15,1
  840A$=GET$
  850IFA$="N"THEN940
```

MINEFIELD

840-930	Display the mines using the space bar (−99) to slow the display down.
940-960	Another game?
970-1000	Proceed to pause for thought.
1010	Define a procedure to set the scene for the game. Note that this is in MODE 7 and if the program is used on an Electron line 1030 should be changed (basically remove all the CHR$ commands) to stop the use of teletext commands.
1020-1120	Set the scene. In line 1100 leave out the CHR$130 as this is teletext, if you are using an Electron.
1130	Define a procedure to give the playing instructions.
1140-1350	And give them.



```
  860PRINTTAB(1,1);"PRESS SPACE BAR TO S
LOW PRINTOUT       "
  870FORN=1TO2000:NEXT
  880FORA%=1TO30
  890FORB%=1TO20
  900IFINKEY(-99)THENFORN=1TO200:NEXT
  910IFMF%(A%,B%)=2THENPRINTTAB(A%+6,B%+
3);"O"
  920IFMF%(A%,B%)=0THENPRINTTAB(A%+6,B%+
3);" "
  930NEXT,
  940PRINTTAB(1,1);"DO YOU WANT ANOTHER
GAME ??          ";*FX15,1
  950A$=GET$
  960IFA$="N"ORA$="n"THENEND ELSERUN
  970DEFPROCPause(P%)
  980FORN=1TOP%
  990NEXT
 1000ENDPROC
 1010DEFPROCInt1
 1020FORN%=3TO4
 1030PRINTTAB(10,N%);CHR$141;CHR$129;CHR
$157;CHR$134;"MINEFIELD   ";CHR$156:NEXT
 1040PRINT''''"You are the advance scoun
t"
 1050PRINT"for your troop.Your task is t
o"
 1060PRINT"map out the minefield, and to
 isolate"
 1070PRINT"as many mines as possible."
 1080PRINT"The more pathways you discove
r,"
 1090PRINT"the higher your score will be
."
 1100PRINT''CHR$130"Press any key to con
tinue":*FX15,1
 1110A$=GET$
 1120ENDPROC
 1130DEFPROCInt2
 1140PRINT''"     You=  ";CHR$226
 1150PRINT"  Block=  ";:COLOUR2:PRINT;CH
R$225:COLOUR3
 1160PRINT"Mystery=  ";CHR$224
 1170PRINT"    Flag=  ";CHR$227
 1180PRINT"Boundry=  ";:COLOUR1:PRINT;"#
":COLOUR3
 1190PRINT''''"Every time you move, you w
ill"
 1200PRINT"be told the number of mines t
hat"
 1210PRINT"there are in the eight square
s"
 1220PRINT"immediately around you"
 1230PRINT"Using this information you sh
ould"
 1240PRINT"be able to isolate the mines"
 1250PRINT"without actually going on the
m."
 1260PRINT"You cannot go through the Blo
cks."
 1270PRINT"Go through the flags for Bonu
s points"
 1280PRINT'" The controls are:"'
 1290PRINTSPC(15)"UP"
 1300PRINTSPC(15)":"
 1310PRINTSPC(9)"LEFT Z X RIGHT"
 1320PRINTSPC(15)"/"
 1330PRINTSPC(14)"DOWN"'
 1340PRINTSPC(7)"Please wait"
 1350ENDPROC
```

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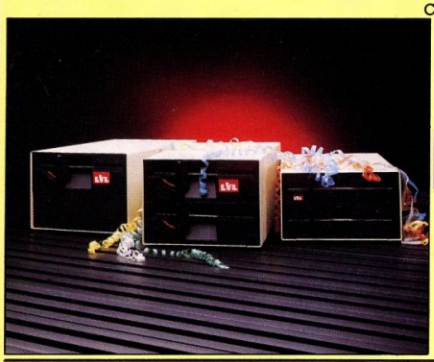

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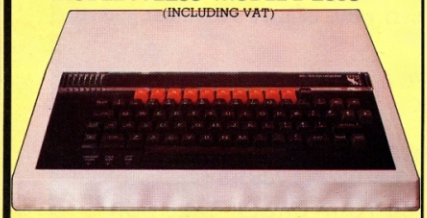

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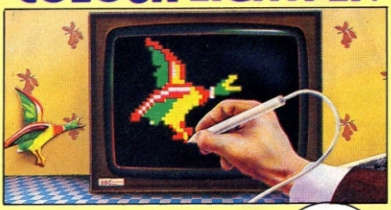
COLOUR LIGHTPEN



The lightpen is compact, reliable and comes in a rugged metal case providing physical and electronic protection. Its sensitivity can be adjusted to match any make of TV screen, giving the highest levels of accuracy.

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LOVE STORY

"Gordon Baker had often thought about buying a computer, but his courage always failed him at the vital moment. "I'm not a technical man", he explained. "I need patience and understanding and when I saw Columbia in a recent issue of a computer magazine, it looked so attractive and uncomplicated that I just had to send for more details."

A package arrived from Icarus the following Monday. With trembling hands Gordon opened it and read through the letter and introductory brochure. It seemed too good to be true: Columbia embodied all that had been missing from his previous relationships.

A meeting was arranged.

Gordon passed that afternoon with his local Icarus dealer in a state of near ecstasy! Columbia was not only attractive to look at, but, as the dealer explained and demonstrated, proved extremely competent without being overly complicated.

Soon after that initial contact Gordon had to fly North on business and it was a fortnight before he could contact the dealer to fix another meeting. It was decided to bring Columbia round to Gordon's office to be introduced to the staff. It was vital to establish as soon as possible whether Columbia could operate efficiently in his own business environment.

Things could not have gone better. Columbia was a big hit with everybody; Accounts, Stock Control, Sales, Research and Forecasting were all of one accord: Columbia was terrific.

They enthused over the high resolution amber screen, were effusive about the choice of CP/M 86 and MS-DOS operating systems and IBM PC compatibility, and then became quite emotional over Columbia's floppy and Winchester disc configurations, its expandability up to 896K RAM and the access it gave to hundreds of 16 BIT 'off the shelf' software packages.

The dealer asked Gordon if he would like to see Columbia again. "Oh, please", said Gordon, "could it stay for just a couple more days?"

Within a week Columbia had moved in permanently, and Gordon was on top of the world.

"I'd just about given up hope of ever finding my perfect partner", he said, "until Columbia came along and changed my life!"

In the background, the warm glow from the amber screen seemed to indicate that Columbia too was well pleased with the situation . . ."

The Columbia 16 BIT Personal Computer

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Your perfect partner

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DATABASICS

This week PCN Databasics lists a selection of add-ons for your micro. PCN keeps you up to date in three-week cycles, listing peripherals, then software, followed by micros.

Printers are best categorised by print-head type. The two most common methods of transferring type to paper are the **Dot matrix** and **Daisywheel** techniques.

A dot matrix printer uses a row of pins which are programmed to strike the paper through a ribbon and form the character as a pattern of dots.

The daisywheel acts more like a conventional typewriter, the character set being pre-formed on a wheel with each character on a separate spoke. As the interchangeable wheel rotates it is struck by a hammer to form the character impression.

Dot matrix printers tend to be faster than daisywheel but offer lower print quality.

In selecting a printer make sure the **interface** on your computer is compatible with those available as standard or at extra cost on the printer.

The ● sign means the interface is included in the price; O means you have a choice of interfaces included in the price; + means the interface will cost extra.

Max Baud rate indicates the approximate characters-per-second rate as they are fed into the printer.

The **buffer** stores characters sent by the computer. The printer can take characters in chunks, at a rate quicker than they are able to be printed, sometimes allowing the computer to be freed for further use.

Lines per inch indicates the maximum number of lines printed in a vertical inch. **Characters per inch** can be varied on some printers as the typesizes themselves can be adjusted.

Maximum print speed as indicated by the manufacturer tends to be a little optimistic. **Maximum print positions** tells you the optimum number of characters that can be printed in one line by the smallest character size on the printer. **Maximum paper width** is the widest paper the printer can take.

Size represents the space the printer takes up on a desk top. **The weight** of the printer is given in kilogrammes.

Maximum copies indicates the number of carbon copies that can realistically be produced at one time.

Underlining puts a line under characters while **bold type** thickens the characters to make them stand out. **True descenders** indicates that the print method allows for fully formed tails on letters such as p,g or q.

Proportional spacing puts the same space between characters whether they are a long 'm' or a short 'i'. **Block graphics** builds up pictures using rectangular blocks, while **High Resolution Graphics** uses smaller dots.

Bidirectional means the printer can save time by printing left to right and then doing the next line backwards right to left. Similarly, **Logic Seeking** enables the machine to save more time by printing the short lines without sweeping over the whole width of the page.

Feed methods comprise **fanfold** which uses continuous stationery sheets folded road-map style drawn into the printer by a tractor mechanism. The tractor cog fits into holes in the fanfold paper and takes the paper past the printer mechanism. **Roll** is a roll of paper that feeds into the printer, usually using **friction feed** where the paper is gripped between two rollers, typewriter-style. **Cut sheet** indicates the printer uses single sheets like a typewriter.

Distributor: to find which company distributes a particular add-on, use the code listed in this column to refer to the distributor table.

The table is at the end of the listings, and gives the distributor's name and telephone number.

PERIPHERALS

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES ● inc in price, ○ = options at extra cost (+)						Max baud rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (CPS)	Max print positions	Max paper width in inches	Size (base area in cms)	Weight (in kilos)	Max Copies	Underlining	Bold Type	True Descenders	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi Directional	Logic Seeking	Feed Method				Distributor
			I-EEE	Centronics	20ma	RS232	Others ●	Others (+)																			Fan fold	Roll	Cut Sheet	Tractor	Frictional	
PRINTERS																																
Adler TRD 170	£833	Daisywheel		●		●			9600	256	6,8	10,12,15	17	198	15.5	56×37	13	6	●	●	●	●			●	●	●	●	●	●	●	T2
Anadex DP 9000A	£1,397	M 7×9, 9×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	106	9.5	40.9×57	13.6	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9001A	£1,397	M 7×9, 11×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	132	9.5	40.9×57	13.6	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9500A	£1,397	M 7×9, 9×9, 13×9		●	●	●			9600	2700	6,8	10,12,13.3	200	176	15.5	40.9×70.3	16	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9501A	£1,397	M 7×9, 11×9		●	●	●			9600	2700	6,8	10,12.5,15,16.7	200	220	15.5	40.9×70.3	16	6	●	●	●			●	●	●	●			●		I1
Anadex DP 9620A	£1,489	M 7×9,9×9,13×9		●		●			9600	1500	6,8	10,12,15,16.4	200	216	15.5	40.9×70.3	16	6	●	●	●			●	●	●	●			●		I1
Anadex WP 6000	£2,616	M up to 18×20		●		●			19200	4500	6,8,12,16	10,12,16.7	285	220	15.5	46.7×74.9	25	6	●	●	●	●		●	●	●	●		●	●	●	I1
ASP 3500	£977	M 9×7, 9×9		○		○			9600	80	6,8	10,12,16.5	180	217	14	61.5×40.5	19	6	●	●	●		●	●	●	●	●					M1
Brother EP22	£170	M 7 × 5				●			300	N/A	6,4,3	10	17	75	8¼	31.5 × 23.7	2.4												●		●	J1
Brother HR15	£512	Daisywheel		●	●	●			9600	3000	6,4,3	15,12,10	13	165	13	46.4 × 33	8.9	4	●	●	●	●			●	●	●			●	●	●	J1
Brother HRI	£747	Daisywheel		○		○	○		9600	2000	4,5,6	10,12,15	35	198	16.5	38.1×71.2	16	8				●			●	●				●		●	J1
Canon AP400	£1,140	Daisywheel	●			●		1	19200	4000	4,6,8	10,12,15	25	197	15.5	50.8×48.2	18.5	6	●	●	●	●	●		●	●	●	●	●	●	●	D1
Centronics 159/4	£962	M 9×7				●			9600	768	6	5,8.18,10,16.36	150	80	10	38×35.6	10	5							●	●	●			●	●	B1
Centronics 150/4	£682	M 9×7				●		1	9600	768	6,8	10,12,16.36	150	132	9.5	38.1×35.5	9.1	3	●			●	●			●	●			●	●	R1
Centronics 152/4	£788	M 9×7				●		1	9600	708	6,8	10,12,16.5	150	217	9.5	38.1×35.5	9.1	3	●			●	●			●	●			●	●	R1
Centronics 154	£869	M 11×8		●		●			9600	2000	6,9,12,18	5,10,16.5	120	132	15	52.6×37.1	13	5	●			●		●	●	●	●			●		C1

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES ● inc in price, ○ = options at extra cost (+)						Max baud rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (CPS)	Max print positions	Max paper width in inches	Size (base area in cms)	Weight (in kilos)	Max Copies	Underlining	Bold Type	True Descenders	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi Directional	Logic Seeking	Feed Method					Distributor
			I-EEE	Centronics	20ma	RS232	Others ●	Others (+)																			Fan Fold	Roll	Cut Sheet	Tractor	Frictional	
PRINTERS																																
Centronics 159/2	£881	M 9×7		●					N/A	768	6	5,8.18,10,16.36	150	132	10	38.1×35.6	10	5							●	●	●		●	●	●	B1
Centronics 351	£1,891	M 7×9		●	+	●			19200	2000	6.8	5,6,8.25,10,12,16.5	200	192	15	45.7×55.9	18	6	●	●	●	●		●	●	●	●	●	●	●	●	●	B1
Centronics 352	£1,966	M 7×8		●	+	●			19200	2000	6.8	5,6,7.5,8.25,13.2,15,16.5	200	218	14.5	55.9×45.7	18.1	6	●						●	●	●	●		●	●	●	C1
Centronics 353	£2,420	M 7×8			+	●			19200	4000	3,4,6,8,12	10,12,13.2,15,16.5	200	218	15	55.9×45.7	18.1	6	●		●				●	●	●	●		●	●	●	C1
Centronics 739/2	£710	M 11×9		●					2200	132	6	5,8.3,10,16.7	100	132	9	36.8×27.9	5.4	5	●			●			●			●	●		●	C1
Centronics 739/4	£786	M 11×9				●			9600	512	6	5,8.3,10,16.7	100	132	9	36.8×40.6	7.2	5	●			●			●			●	●		●	C1
Commodore 4022P	£454	M 6×7	●						N/A	N/A	2	5,10	40	80	10	36.8×33	9.9	3							●	●	●	●		●		C2
Commodore 8023	£1,029	M 5×8	●						N/A	N/A	2	5,10	150	250	15	51.4×36.8	11.6	3		●					●	●	●	●	●	●		C2
Data Products DP55	£1,687	Daisywheel				●		2	9600	1000	6.8	10,12,15	55	198	15	44.4×60.4	24	6	●	●	●	●			●	●	●	●				●	S1
Data Products M100	£1,790	M 9×9		+		+	1		N/A	N/A	6.8	5,8.10,16.5	140	218	16	67.5×59.4	27	6	●	●	●	●	●	●	●	●	●				●		S1
Data Products M200	£1,979	M 7×7		+		+	1		N/A	N/A	6.8	5,10.8,16.7	340	340	16	67.5×59.4	27	6	●	●	●	●	●	●	●	●	●				●		S1
Data South DS180	£1,604	M 9×7	+	●	+	●		1	9600	2000	6.8	5,6,8.25,10,12,16.5	180	217	15.5	60.9×40.6	16	6	●	●	●	●		●	●	●	●				●		D2
Diablo SP1/P11	£2,127	Daisywheel				●			9600	256	6.8	10,15	40	198	16	56.9×46.3	27.2	6	●	●	●	●			●	●			●			●	M2
Diablo 630	£2,127	Daisywheel				●			9600	768	6.8,12	10,12,15	40	198	16.5	56.9×46.3	27	6	●	●	●	●			●	●	●				●	●	M2
DMP 100	£249	M 5×7		●		●			1200	2000	6.8	10.5	50	80	9.5	40.6×20.9	3.9	1	●	●	●	●		●	●		●				●	●	T1
DMP 200	£499	M 9×23		●		●			1200	2000	6.8	10	120	120	9.5	41.9×34.3	7.5	3	●	●	●	●	●	●	●	●	●	●			●	●	T1
DMP 400	£699	M 7×9, 9×9		●		●			1200	2000	6.8	10,12,16.7	140	220	15	61.9×40.4	19	5	●	●	●	●	●	●	●	●	●			●	●		T1
DMP 500	£1,099	M 23×9		●					9600	2000	6.8	10,12,16.7	220	220	15	58.4×33	12.7	5	●	●	●	●	●	●	●	●	●			●	●		T1
DMP 2100	£1,399	M		●		●			1200	2000	6.8,12	10,12,16.6	160	232	15	55.2×38.1	20	8	●	●	●	●	●	●	●	●	●			●			T1
DRE 8820	£895	M 9×7		○		○			9600	500	6.8	10,12.5,15,16.7	150	266	15.5	64.7×47.6	23	5	●		●				●	●	●	●			●	●	G1
DRE 8830	£1,300	M 9×7		○		○			9600	500	6.8	10,12,13.3,15,17	180	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●			●	●	G1
DRE 8840	£1,370	M 9×7		○		○			9600	500	6.8	10,12,13.3,15,17	240	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●			●	●	G1
DRE 8925	£1,660	M 12×8, 12×20		○		○			9600	500	6.8	10,12,15,16.7	120	226	15.5	64.7×47.6	23	5	●		●				●	●	●	●			●	●	G1
DRH 80	£621	M 7×9		○		○			9600	256	6.8	10,12.5,15,17.5	80	140	8	41.5×30	7.5	4	●	●	●	●		●	●	●	●	●	●	●	●	●	T1
DRH 136	£776	M 7×9		○		○			9600	2000	6.8	10,12,15,16.5	120	224	15.5	48.6×30.3	10.5	3	●	●	●	●		●	●	●	●				●	●	T1
DRS 250	£1,431	M 7×9		○		○			19200	512	6.8	10,12,15	250	198	6	61×45	25	5	●	●	●	●		●	●	●	●				●		T1
DWP 410	£995	Daisywheel		●					9600	2000	6.8	10,12	25	160	16	60.3×19.6	16	5	●	●	●	●			●	●	●			●	●	●	T1
Epson RX-80 FT	£366	M	●	●	●	●	●		19200	256	6.8,10.3	10,12,17.5,6,8.5	100	80	10	38.9×30.3	5.1	3	●	●	●		●	●	●	●	●	●	●	●	●		E1
Epson RX80	£320	M	●	●	●	●		●	19200	256	6.8,10.3	10,12,17,56,8.5	100	80	10	38.9×30.3	5.1	5	●	●	●		●	●	●	●	●	●	●	●	●		E1
Epson FX-80	£503	M	●	●	●	●		●	19200	300	6	10,12,17,5,6,8.5	160	80	10	42×34.7	7.5	3	●	●	●	●	●	●	●	●	●	●	●	●	●		E1
Epson MX-100 III	£546	M	●	●	●	●		●	19200	256	6.8	10	100	136	15½	59.2×39.3	10	3	●	●	●	●	●	●	●	●	●	●	●	●	●		E1
Epson FX-100	£654	M	●	●	●	●		●	19200	300	6	10,12,17,5,6,8.5	80	132	16	61.5×35.4	10.5	3	●	●	●	●	●	●	●	●	●	●	●	●	●		E1
Epson MX80	£401	M 9×9		●	+	+		1	19200	256	6.8	5,8.25,10,16.5	80	132	10	40.6×38.1	5.5	3	●	●	●	●		●	●	●	●				●		E1
Epson MX80 FTT/3	£447	M 9×9		●	+	+		1	19200	256	6.8	5,8.25,10,16.5	80	132	10	40.6×38.1	7.7	3	●	●	●	●		●	●	●	●				●		E1
Epson MX82	£546	M 9×9		●	+	+		1	19200	256	8	17.2	80	159	10	40.6×38.1	7.7	3	●	●	●	●	●	●	●	●	●	●	●	●	●		E1
Epson MX100FT/3	£574	M		●	+	+		1	19200	256	8	16.5	100	233	15.5	59.7×40	10	3	●	●	●	●		●	●	●	●	●	●	●	●		E1
Facit 4510	£672	M 9×7		○	○	○			9600	712	6.8	6,12,16,17.5	100	132	11.5	42.5×34.8	9	5	●	●	●	●		●	●	●	●				●	●	A2
Facit 4525	£1,150	M 9×9		○	○	○			9600	512	6.8	5,8.5,10,17	280	132	11.5	46.5×35.6	13.5	5	●	●	●				●	●	●				●		A2
Facit 4542	£2,300	M 9×14		●	+	+			9600	800	6.8	10,12,15	250	232	18	64×45.7	40	5	●	●	●	●	●	●	●	●	●				●		A2
Fujitsu 830	£2,179	Daisywheel		+	●	●			1200	256	3.6.8	10,12,15	80	204	15	59.7×44.9	18	6	●	●	●	●			●	●	●		●	●	●	●	Z1
General Electric 2030	£961	M 9×7					+	1	1200	640	2,4.6,8.12	10,13,16.5	60	218	15.5	54.6×47.6	9.9	2	●						●	●	●	●		●	●	●	Z1
General Electric 2120	£1,751	M 9×7					+	1	1200	640	2,4.6,8.12	10,13,16.5	150	218	15.5	54.6×47.6	9.9	2	●						●	●	●			●	●	●	Z1
General Printer GP300	£2,287	M 9×9, 18×25					●	2	19200	380	6.8	10,12,15	300	120	13.5	52×44.5	20	5	●	●	●	●	●	●	●	●	●				●		I2
General Printer GP300L	£2,490	M 9×9, 18×25					●	2	19200	380	6.8	10,12,15	300	132	13.5	63.5×51.5	24	5	●	●	●	●	●	●	●	●	●				●		I2
Hermes 612C	£2,242	M 36× 18		●	+	●			9600	2000	6.8	10,12,15	200	198	15	426×620×180	22	6	●	●	●	●		●	●	●	●		●	●	●	●	M7
Integrex	£914	M 7×5, 9×6	+	●		+			N/A	37	6.8	10	125	80	10	38.7×32.5	9.6	1						●	●					●			D3
ITT Swift 3342	£1,719	M 9×7			○	○			1200	640	2,3.4,6,8,12	10,13,16.5	150	240	15.5	56×47	10.4	6	●		●				●	●	●			●	●	●	I3
ITT Swallow	£914	M 9×7		○	○	○			1200	640	2,4.6,8.12	10,13,16.5	60	240	15.5	56×47	10	6	●		●				●	●	●				●	●	I3

| | | |

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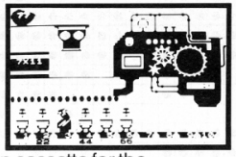

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PRINTERS

Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES ● inc in price, ○ = options at extra cost (+) 1-EEE	Centronics	20ma	RS232	Others ●	Others (+)	Max baud rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (CPS)	Max print positions	Max paper width in inches	Size (base area in cms)	Weight (in kilos)	Max Copies	Underlining	Bold Type	True Descenders	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi Directional	Logic Seeking	Feed Method Fan Fold	Roll	Cut Sheet	Tractor	Frictional	Distributor
Star DP-515	£460	M9×9		●	+	+			9600	2,300	6,8	10,12,17	100	233	15	515×542×136	10	3	●	●	●	●	●	●	●	●	●		●	●	●	M7
Systime Systerm	£1,909	M				●			9600	256	6,8	10	120	132	16	71.7×61	53	6			●		●		●	●	●				●	S4
Systime Sysprint-S	£1,599	M				●			9600	256	6,8	10	120	132	16	71.7×61	53	6			●		●		●	●	●				●	S4
Tandy TRS 80 DW2	£1,299	Daisywheel		●					9600	2000	6	10,12	43	163	16.5	62.4×20.4	27	4	●	●	●	●				●	●		●	●	●	T1
Texas Instruments 745	£1,470	Thermal				●			300	256	6	10,17	30	80	8.5	39.1×40.6	13.5	1										●				R1
Texas Instruments 781	£1,259	Thermal 7×5			●	●			9600	256	6	10,17	120	80	8.5	40.6×15.24	8.5	1								●	●		●			D5
Texas Instruments 810	£1,369	M 9×7		+	+	●			9600	256	6,8	5,8,10,16.5	150	132	15.5	65.4×50.8	25	9								●	●			●		D5
TRD 170S	£834	Daisywheel		○		○			19200	256	6	10,12,15	17	132	15.5	64×45.7	40	5								●	●			●		D5
Toshiba T1350	£1,495	M		○		○			9600	256	6	10,12	192	192	15	55×38	19.9	3	●	●	●	●	●	●	●	●	●	●	●	●	●	T4
Walters WM2000	£477	M 9×9	+	●	+	+			19200	750	6,8,12	5,6,6,8,3,10,13.3,16.6	128	132	10	43.9×33.5	12	4	●	●	●		●	●	●	●	●			●		W1
Walters WM4000	£713	M 9×9	+	●	+	+			19200	1500	6,8,12	5,6,6,8,3,10,13.3,16.6	150	220	15	63×39	13	5	●	●	●		●	●	●	●	●			●		W1
ZX Printer	£40	Electrical						1	N/A	N/A	9	32	50	32	4	14×4.6	N/A	1			●		●	●				●			●	S5

MONITORS

These have been split into **colour** and **monochrome.**

Screen size is a diagonal measurement in inches. Nearly all monochrome monitors accept a **composite video** signal from the computer and most computers are equipped with composite video output. Colour monitors feature a wider range of **signal** systems than mono and it is important to match the output of your computer to the input of the monitor.

An **audio channel** will enable sound to be output from a speaker inside the monitor. **Mono tint** refers to the colour of the text on a mono monitor. Some monitors come with an **anti-glare filter** to relieve operator discomfort.

Band width refers to the frequency range of signals to which the monitor can respond in MegaHertz. **Dot resolution** indicates the number of dots which can be displayed across the screen: the more dots, the sharper the picture.

Dimensions indicates the area the unit occupies on the desktop.

COLOUR MONITORS

Make & Model	Price inc VAT	Screen size (in inches)	Signal: Modulated PAL	Unmodulated PAL	TTL RGB	75 Ohm linear	32 bit 4 bit TTL	Audio channel	Anti-glare filter	Band width (in MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
Crofton C1401	£300	14			●					10	600	37×42	10	C4
HM 2713	£3,120	13			●					25	720	54×40	36	B1
HM 2719B	£2,553	19			●					25	960	50×49	46	B1
HM 2719C	£3,042	19			●					25	960	50×49	46	B1
HM 3619	£3,548	19			●					45	1280	50×44	48	B1
Kaga Vision II	£327.75	12			●				●	15	510	32×30.3	12.5	D6
Lion Cub 1431-TTL	£286	14			●					7	585	65×57.5	11.5	S6
Lion Cub 1436	£316	14				●				7	585	65×57.5	11.5	S6
Lion Cub 1445	£633	14				●	●			15	895	65×57.5	11.5	S6
Lion Cub 1449	£604	14				●				15	895	65×57.5	11.5	S6
Lion Cub 1451-TTL	£430	14			●					10	653	65×57.5	11.5	S6
Lion Cub 1455	£483	14				●	●			10	653	65×57.5	11.5	S6
Lion Cub 1459	£459	14				●				10	653	65×57.5	11.5	S6
Lion Cub 2031-TTL	£344	20			●					7	585	65×57.5	11.5	S6
Lion Cub 2051-TTL	£646	20			●					10	940	65×57.5	11.5	S6

Make & Model	Price inc VAT	Screen size (in inches)	Signal: Modulated PAL	Unmodulated PAL	TTL RGB	75 Ohm linear	32 bit 4 bit TTL	Audio channel	Anti-glare filter	Band width (in MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
Luxor Digital	£574	14			●			●	●	25	800	N/A	15.7	P1
Luxor Linear II	£643	14			●			●	●	25	800	N/A	15.7	P1
Microtech 14	£402	14	●	●	●			●		18	585	33.7 × 40.8	12.6	M6
TM 22	£329	6				●		●		5.5	N/A	22×34.5	4.1	J3
VM 14 PSN	£378	14				●		●		5.5	300	47×40	13.6	J3
Wolf Cub 1435-TTL	£358	14				●	●			7	653	65×57.5	11.5	S6
Wolf Cub 1456	£454	14					●			10	653	65×57.5	11.5	S6

MONOCHROME MONITORS

Make & Model	Price inc. VAT	Screen size	Composite video	Audio channel	Mono tint	Anti-glare filter	Band width (MHz)	Dot resolution	Dimensions (cms)	Weight (kilos)	Distributor
AVT DM 210G	£138	12	●		Green	●	12	750	30.8×29.6	9.5	L1
EG 100	£77	12	●		Green		8	700	37.5×29	8	L1
EG 101	£91	12	●		Green		12	700	37.5×29	8	L1
LEDM 091D	£99	9	●		B&W	●	12	750	22×24	5.4	L1
LEDM 0910	£121	9	●		Green	●	12	750	22×24	5.4	L1
Luxor 10	£212	10	●		Orange	●	22	625	N/A	8	P1
M9	£131	9	●		Green		15-22	650	22.4×25.7	5.7	P1
M12	£144	12	●		Green		15-22	800	29.3×30	9.3	P1
Novex	£114	12	●		Green		12	750	N/A	N/A	P1
N12 1003	£112	12	●		Green		24	800	23×26.5	7	P1
Prince	£126	12	●		Green		24	800	33×50	7	C4
PM 102	£126	9	●		Green	●	24	800	22×28	7	C4
Zenith ZVM121	£99	12	●	●	Green	●	15	N/A	29×29	6.5	P2
U300	£149	12	●		Green	●	18	N/A	34·8×36·8×29·2	7·7	R4

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DISK DRIVES

This section is divided into categories covering 5¼in and 8in floppy disks.

Disk data **capacity** is measured in kilobytes (K): one kilobyte = 1,024 characters. A **no of disks** column is included because some disk units contain two disk drives.

Manufacturers can vary the number of disk data **tracks** and these are divided into sectors. This **sectoring** system allows the information to be stored and retrieved by reference to a timing mark on the disk so the computer can keep track of its rotation. The system can be hard, where reference is kept by a hole in the disk, or soft, where the disk position is monitored by magnetic signals.

Some drives have one read/write head for each side of the disk so the buyer has a choice between **single or double-sided** drives. **BS** means that the drives are both single and double-sided.

As disk technology advanced it became possible to cram more data onto the floppy so drives will feature either **single or double** (data) **density. BD** means that the drives are both single and double density.

The interface acts as an interpreter so the computer and disk can exchange information. Each device must have the same interpreter before a useful cable connection can be made. The **connect to** column allows you to match the disk interfaces to those included in the disk drives or available at extra cost.

5¼" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sides and density	Connects to: I-EEE	RS232	BBC	Apple II	St. Shugart	Nasbus	Gemini	20ma	Others	Distributor
Apple II	£399	143K	1	35	16	SS.SD				●						P2
Atari	£299	90K	1	40	Soft	SS.SD									●	A4
BASF 6106	£195	500K	1	48	Both	SS.BD					●					B6
BASF 6108	£240	500K	1	48	Both	DS.BD					●					B6
BASF 6118	£279	1Mb	1	96	Both	DS.BD					●					B6
Canon X8300	£600	640K	2	80	Soft	DS.DD									●	C5
CD 40	£679	400K	2	40	Both	SS.BD									●	C6
CD 50A	£424	500K	2	40	Both	SS.BD					●					C6
CD 50E	£569	1Mb	2	80	Both	SS.BD					●					C6
CD 50F	£712	2Mb	2	80	Both	DS.BD					●					C6
CD 80	£765	800K	2	80	Both	SS.BD									●	C6
CD 80D	£949	1.6Mb	2	80	Both	SS.BD									●	C6
Commodore 1541	£229	170K	1	35	Soft	SS.SD									●	C2
Commodore 2031	£339	170K	1	35	Soft	SS.SD	●									C2
Commodore 8250	£1,029	2Mb	2	77	Soft	DS.DD	●									C2
Control Data 9408	£221	250K	1	40	Both	SS.BD					●					C7
Control Data 9409	£272	500K	1	40	Both	DS.BD					●					C7
Control Data 9409T	£420	1Mb	1	80	Both	DS.BD					●					C7
Control Data ZL141	£225	250K	1	40	Both	SS.DD			●							M5
Control Data ZL141B	£175	250K	1	40	Both	SS.DD			●							M5
Control Data ZL142	£360	500K	2	40	Both	SS.DD			●							M5
Control Data ZL241B	£240	500K	1	40	Both	DS.DD			●							M5
Control Data ZL291	£380	1Mb	1	80	Both	DS.DD			●							M5
Control Data ZL291*	£405	500/1Mb	1	40/80	Both	DS.DD			●							M5
Control Data ZL291B	£320	1Mb	1	80	Both	DS.DD			●							M5
Control Data ZL292	£640	2Mb	2	80	Both	DS.DD			●							M5
CS 40	£482	200K	1	40	Both	SS.BD									●	C6
CS 50A	£229	250K	1	40	Both	SS.BD					●					C6
CS 50E	£305	500K	1	80	Both	SS.BD					●					C6
CS 50F	£397	1Mb	1	80	Both	DS.BD					●					C6
CS 80	£523	400K	1	80	Both	SS.BD									●	C6
CS 80D	£627	800K	1	80	Both	DS.BD									●	C6
Cumana AS100	£252	200K	1	35	Soft	SS.BD				●						C6
Cumana DA8035	£857	655K	2	80	Soft	SS.BD				●						C6
EG 401AT	£370	102K	2	40	Soft	SS.BD					●					L1
FD-525A	£270	143K	1	40	Soft	SS.SD				●						R4
Gemini 825	£403	400K	1	80	Soft	SS.DD									●	G2
Gemini 825	£518	800K	1	160	Soft	DS.DD									●	G2
Gemini 825	£661	800K	2	80	Soft	SS.DD									●	G2
Gemini 825	£776	1.6Mb	2	160	Soft	DS.DD									●	G2
Lowe EG 400AT	£426	200K	2	40	Soft	SS.BD					●					L1
Lowe EG 400T	£253	102K	1	40	Soft	SS.BD					●					L1
M 4853	£311	1Mb	1	80	Soft	DS.DD					●					A3
M 4854	£368	1.6Mb	1	77	Soft	DS.DD					●					A3
Megastore MIOS	£1,034	1.2Mb	2	80	Soft	DS.DD				●					●	V1
Multi Floppy Drive	£592	8Mb	5	770	Soft	SS.DD	●									H1
RM MDS-1	£1,950	144K	1	40	Soft	DS.SD		●							●	R3
RM MDS-2	£2,147	288K	2	40	Soft	DS.SD		●							●	R3
Scorpio 8	£863	8Mb	5	770	Soft	SS.DD	●									H1
Sharp MZ80 FB	£856	560K	2	70	Soft	DS.DD									●	S7
Tandy Colour	£449	175K	1	40	Soft	SS.DD									●	T1
Tandy 26-1160	£299	75K	4	40	Soft	SS.SD					●					T1
Tandy 26-3023	£299	156K	4	35	Soft	SS.DD					●					T1
Tandy Model 1	£389	90K	1	35	Soft	SS.SD									●	T1
Tandy Model 111	£369	175K	2	40	Soft	SS.DD									●	T1
TM 101-4	£282	1Mb	1	160	Soft	SS.DD	●									H1
TM 102-2	£393	2Mb	1	160	Soft	SS.DD	●									H1
TM 848-1	£389	800K	1	77	Soft	SS.DD	●									H1
TM 50-1	£147	250K	1	40	Soft	SS.DD	●									H1
TM 100-1	£158	250K	1	40	Soft	SS.DD	●									H1
TM 100-2	£221	500K	1	80	Soft	DS.DD	●									H1
TM 100-4/4M	£247	1Mb	1	160	Soft	DS.DD	●									H1
Tracker 1	£373	1Mb	2	80	Soft	SS.DD					●					D7
Tracker 2	£497	2Mb	2	80	Soft	DS.DD					●					D7

8" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of discs	Tracks	Sectoring	Sides and density	Connects to: I-EEE	RS232	BBC	Apple II	St. Shugart	Nasbus	Gemini	20ma	Others	Distributor
ACP 700 (AC)	£293	1Mb	1	77	Soft	DS.DD									●	E2
ACP 750 (DC)	£316	1Mb	1	77	Soft	DS.DD									●	E2
ACP 1500 (DC)	£403	2Mb	1	77	Soft	DS.DD									●	E2
Caldisk 142M	£465	500K	1	77	Both	SS.BD									●	E2
Caldisk 143M	£522	1.2Mb	1	77	Both	DS.BD					●					F1
Caldisk 143M-1	£465	500K	1	77	Both	SS.BD					●					F3
Commodore 8280	£2,760	987K	2	77	Soft	DS.DD	●									C2
Canon X 8330	£1,200	2Mb	2	153	Soft	DS.DD									●	C5
Control Data 9404B	£684	800K	1	77	Both	SS.BD					●					M5
Control Data 9406-4	£1,144	1.6Mb	1	77	Both	DS.BD					●					M5
Eicon FD8/1D/DD	£1,438	1Mb	1	77	Soft	SS.DD				●						E3
Eicon FD8/1D/SD	£1,397	500K	1	77	Soft	BS.SD				●						E3
Eicon FD8/2D/FBR	£1,740	1Mb	2	77	Soft	DS.SD									●	E3
Eicon FD8/2D/DD	£2,013	2Mb	2	77	Soft	SS.DD				●						E3
Eicon FD8/2D/SD	£1,972	1Mb	2	77	Soft	SS.SD				●						E3
Eicon FD8/1D/FBR	£1,240	500K	1	77	Soft	DS.SD									●	E3
F 311	£1,725	1.2Mb	2	76	Soft	DS.SD									●	B5

8" DISK DRIVES

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sides and density	Connects to: I-EEE	RS232	BBC	Apple II	St. Shugart	Nasbus	Gemini	20ma	Others	Distributor
F 320	£2,300	2.4Mb	2	76	Soft	DS.DD									●	B5
M 2894	£499	1.6Mb	1	77	Soft	DS.DD					●					A3
M 2896	£493	1.6Mb	1	77	Soft	DS.DD					●					A3
Megastor 11 DD	£1,133	2Mb	2	77	Soft	DS.DD				●						V1
Megastor 11SD	£1,018	1Mb	2	77	Soft	DS.SD				●					●	V1
Megastor 111	£1,121	2Mb	2	77	Soft	DS.DD				●					●	V1
R.M. FDS-2	£3,789	1Mb	2	77	Soft	DS.SD	●								●	R3
Tandy Model 11	£999	486K	1	77	Soft	DS.SD.									●	T1
Tandy Model 16	£949	1.2Mb	1	77	Soft	DS.DD									●	T1
Tandy Model 16	£1,549	2.5Mb	2	77	Soft	DS.DD									●	T1

MODEMS

A modem interfaces a computer and the telephone system so computers can communicate over long distances. It converts data to electrical pulses or sounds that can be sent down the line. A modem can be connected to the line directly or acoustically. A **D** in the **connection** column represents direct link, while **A** indicates acoustic. The acoustic coupler is like a female telephone handset: with a speaker in the coupler opposing the phone's mouthpiece and a microphone opposing the earpiece. A **B** in this column indicates that both methods of attachment are available. **Baud** rate shows the speed with which the data is transmitted.

The modem must be connected to the computer through an interface. The **interface** column lists the main interfaces featured on each modem. **Asynchronous** means that data may be transferred at intervals as available or as needed. **Synchronous** data is transmitted at regular intervals. **Simplex** transfers data in one direction, while **Half duplex** can transmit/receive in either direction, but not simultaneously. **Full duplex** transmits and receives information in both directions at once. Some modems can **originate** a call or start a two-way conversation. **Answer** means they can respond to a call from another computer.

Make and Model	Price inc VAT	Connection	Data Rates (baud)	Interface	Others	Capabilities: Asynchronous	Synchronous	Simplex	Half Duplex	Full Duplex	Originate	Answer	Distributor
AD 1223	£287.50	D	1200	RS232		●			●		●	●	A6
AJ 311	£320	B	300	RS232		●			●	●	●	●	A5
AJ 1234	£684	A	1200	RS232		●	●			●	●		A5
AM 211	£387	B	300	RS232		●			●	●	●		A5
Bermac 1200/1 Model A	£414	D	1800	RS232		●			●		●		B3
Bermac 1200/1 Model B	£460	D	1800	RS232		●			●		●	●	B3
Commodore 64 Modem	£99.95	D	1200	C-64 cartridge port		●			●	●	●	●	C2
CCITT CAT	£228	A	300	RS232/V24		●			●	●	●	●	D8
CDSV22	£719	D	1200	RS232/V24		●	●			●	●	●	D8
DSL2123	£329	D	300/1200	RS232/V24		●			●	●	●	●	D8
Prism VTX 5000	£99.95	D	1200	Sinclair Spectrum		●			●	●	●		P3
Prism 1000	£69.95	D	1200	RS232		●			●	●	●		P3
Prism 2000	£84.94	D	1200	RS232		●			●	●	●		P3
Sendata 700 Series A	£253	A	300	RS232, 20ma	1	●				●	●	●	B4
Sendata 700 Series B	£224	A	300	RS232, 20ma	1	●				●	●		B4
Sendata 700 Series C	£309	A	600-1200	RS232, 20ma	1	●			●		●	●	B4
Sendata 700 Series E	£149	A	300-1200	RS232, 20ma	1	●		●			●		B4
Racal 126 LS1	£782	D	2400	V24			●			●	●	●	R2
Racal MPS 3021	£295	D	300	V24		●				●	●	●	R2
Racal MPS 1222	£678	D	1200	V24		●	●			●	●	●	R2

PLOTTERS

Plotters use a pen to put graphics or characters on paper under the command of a computer. They are usually one of two types—flatbed or drum. A **flatbed** holds the paper flat while the pen draws on it in two dimensions. A **drum** plotter turns the paper vertically on a cylinder while the pen moves horizontally. Most plotters can change pens during operation so a variety of colours and line thicknesses are available. **Max pens** indicates the number of pens in operation or on standby. Dimensions of the paper to be used are listed under **paper size. Maximum plotting speed** measures the distance in millimetres per sec covered by the pen. **Interfaces** are included in the basic price or come at extra cost.

Make and Model	Price inc VAT	Type	Max Pens	Paper Size	Maximum Plotting Speed in secs.	Interface (+ at extra cost)	Distribution
Calcomp 81	£3,392	Flat	8	A3	30cm	RS232 or IEEE	C3
HP 7470A	£1,317	Drum	2	A4	38.1cm	RS232 (IEEE+)	H2
MT Pixy 3	£688.85	Flat	3	A4	200mm	Parallel (RS232 +)	M3
PD4	£585	Flat	1	A4	700mm	(IEEE+)	J2
RY-21	£747.50	Flat	1	A4	200mm	Centronics, (RS232+)	R5
RY-10MZ	£1,865	Flat	8	A3	400mm	Centronics, (RS232, IEEE+)	R5
Strobe 100	£662	Drum	1	A4	7.6cm	(RS232, Parallel+)	D6
TRS-80 Pen Plotter	£1,399	Flat	6	A4	6.8cm	RS232	T1
Watanabe WX 4635	£2,301	Flat	1	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4637	£2,862	Flat	2	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4638	£2,635	Flat	1	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4671	£1,129	Flat	1	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4675	£1,638	Flat	6	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4731	£1,761	Drum	4	A3	200mm	(Centronics, RS232, IEEE+)	E4

DISTRIBUTORS

A1 Appropriate Technology, 01-625 5575 **A2** Advent Data Products, Melksham 706289 **A3** Altex Microcomputers Ltd, Reading 791579 **A4** Atari International (UK), Slough 33344 **A5** Anderson Jacobson Ltd, SLough 25172 **A6** Alpha Datasystems, 058 27 66136

B1 Bytech, Reading 61031 **B2** British Olivetti, 01-785 6666 **B3** Barron McCann, Biggleswade 316286 **B4** Bencom Sendata (UK), 01-940 1386 **B5** Baydel Ltd, Leatherhead 378811 B6 BASF, 01-388 4200

C1 Centronics, 01-581 1011 **C2** Commodore Business Machines, Slough 79292 **C2** Caicomp Ltd, Bracknell 50211 **C4** Crofton Electronics, 01-8911923 **C5** Canon (UK) Ltd, 01-680 7700 **C6** Cumana, Guildford 503121 **C7** CBL, Reading 792097

D1 Discom, Evesham 3591 **D2** Datatrade Ltd, Northampton 22289 **D3** DNCS Ltd, 061-643 0016 **D4** DRG, Weston-super-Mare 415398 **D5** Data Systems Division, Bedford 223889 **D6** Data Efficiency, Hemel Hempstead 63561 **D7** Data Track Technology, New Milton 619650 **D8** Dacom Systems, Milton Keynes 676797

E1 Epson (UK), 01-900 0466 **E2** Elecomatic, 041-881 5825 **E3** Eicon, Barhill 81825 **E4** Environmental Equipments Northern Ltd, Nantwich 625115

F1 Fastcol, Reading 791557

G1 Geveke Electronics, Woking 26331 **G2** Gemini Micros, Amersham 28321

H1 HAL Computers Ltd, Farnborough 517175 **H2** Haywood Electronic Asoc. Ltd 01-428 0111

I1 Informex Ltd, 01-318 4213 **I2** Intac Data Systems, Rotherham 547170 **I3** ITT Business Systems, Brighton 507111 **I4** ITT Consumer Products, Basildon 3040 **I5** Inteligent Interfaces, Stratford-upon-Avon 296879

J1 Jones & Brother, 061-330 6531 **J2** J J Lloyd Instruments, Lockswheath 4221 **J3** JVC, 01-450 2621

L1 Lowe Electronics, Matlock 4995

M1 Mitsui & Co Ltd, 01-600 1777 **M2** Modata, Tunbridge Wells 41555 **M3** Mannesmann Tally Ltd, Reading 788711 **M4** Micropute, Macclesfield 615384 **M5** Microware, 01-272 6237 **M6** Microtech Leeds, Leeds 679964 **M7** Micro Peripherals Ltd, Basingstoke 3232

N1 Newbury Data Recording, Newbury 48864

P1 Phoenix Technology, 01-737 3333 **P2** Pete & Pam Computers, Rossendale 227011 **P3** Prism Microproducts 01-253 2277

Q1 Qume (UK) Ltd, Reading 584646

R1 Rair Ltd, 01-836 6921 **R2** Riva Terminals, Woking 71001 **R3** Research Machines Ltd, Oxford 249866 **R4** Roland (UK) Ltd., 01-568 4578 **R5** Rikadenki Mitsui Electronics, 01-397 5111 **R6** Real Time Printers Ltd., 0276 681444

S1 Sintron Electronics, Reading 875464 **S2** Sord, 01-930 4214 **S3** Stotron, Coventry 613521 **S4** Systime, Leeds 702211 **S5** Sinclair Research, Camberley 685311 **S6** Silicon Express, Leicester 374917 **S7** Sharp Electronics, 061-205 2333 **T1** Tandy Company, Walsall 648181 **T2** Triump Adler, 01-250 1717 **T3** Technology For Business, 01-837 1271 **T4** Toshiba Office International, Sunbury-on-Thames 85666 **T5** Torch Computers, 06284 75303

V1 Vlasak, High Wycombe 448633

W1 Walters Microsystems Int Ltd, High Wycombe 445175

X1 X-Data Ltd., Slough 723331

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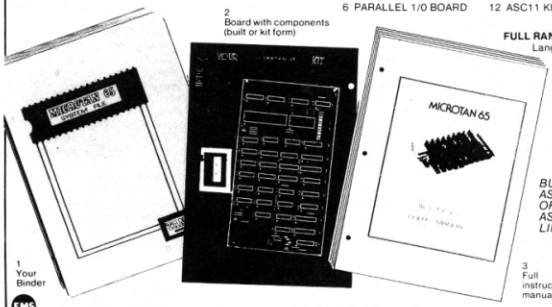

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Cumana disk drive for sale. 100K, 40-track, 6 months old, still under guarantee, immaculate condition, £170. Tel Philip on 0934-863004 or 0934-862231.

Software for 16K ZX81 Trader, £6. Orwell cassette 4, £4. Flight Simulation, £4. 3D Defender, £4. QS Scramble, £3. Space Raiders, £3. Tel 0833-37386.

Oric-1 48K, software, printer cable, tape leads, excellent condition, worth £180. Accept £115 for quick sale. Tel Torquay 0803-24252.

Wanted Spectrum software. Collector will pay cash for all types original makers with cassette slip. Collect London area. Details first — Tel 01-520 0904.

8" floppy disks for sale. Some unused, others used once. Buyer collects. Nicholls, 50 Bradbourne Rd, Sevenoaks, Kent. Tel Sevenoaks 0732-461381.

Spectrum software for sale. Hobbit, £8, VU3D, £6, Abersoft Forth, £10, Heathrow ATC, £5. £25 the lot. Good Christmas bargains! Tel Rugby 832468 evenings.

MZ80A only £399. Variety of software included, all only three months old. All in excellent condition. Tel Glossop 63172 after 5pm or weekends.

Oric-1 48K cassette, £42. Software and one Oric mag. £200 or swap for CBM 64 plus cassette. 218 Sicey Ave, Shiregreen, Sheffield S50 RP.

Printer for sale: Tandy DMP100. As new. Cost £299, but selling for £185 ono, full graphics parallel and serial interfaces. Contact Adrian: Tel Warwick 0926-497231.

ZX81 + 16K four games. Hardly used, £45 ono. Aquarius brand new, £45 ono. Tel 01-422 4330.

Numbers 5 to 42 of *Personal Computer News* for sale, most of them in very good condition. 35p each or £12 the lot. Tel 01-267 6201.

Commodore 64 plus twin 3040 disk drives, Commodore 4022P printer Interpod interface manuals, disks and software. Bargain £1,110. Call Josh, 01-328 3775 after 6pm.

Lynx 48K plus manual, leads, and some games. As good as new, £150. Tel Burgess Hill (Sussex) 044-46 46694. Could deliver London W1 area.

Leicina standard eight cine camera, fixed lens, £200. Also Psion VuCalc Peekocomp and desk diary for BBC B. Tel 01-310 7162.

Spectrum software for swapping all Ultimate's games plus 18 others (Timegate, VU3D, GTX, Mr Wimpy etc. Tel Darren on 01-474 9447 after 5pm or weekends.

My entire GB stamp collection Catval approx £2,500-plus for a 48K computer and printer, valued same, £300. MZ80K 1st choice. Tel Sheffield 389202.

Apple games: Microwave, Choplifter, Hi-res adventures, Time Zone, Choplifter, ABM, Pegasus II, Threshold, Sneakers, Wizardry 1, 2, Taxman and more. Tel Paul, Potters Bar 52294.

Dragon 32, Joysticks, Cassette Recorder, £220 (£1R275). Lots Software, £72 (IRE90). Fergus Sullivan, Market Street, Kells, Meath. Tel Kells 046-40365. Also Epson MX-80.

Tandy printer VII 80 col, centronics and RS232 (suitable for Spectrum interface 1). £120 with ribbons, lead, paper. Mr Bryant, Tel 01-381 2626 work or Orpington 25263 home.

48K Spectrum for sale. Piles of software still boxed, software worth over £100. Best offer accepted. For details phone 01-958 6421 after 5pm.

TRS-80 colour computer, 32K with joysticks, CGP-115 printer/plotter, boxed with Scripsit, Edtasm+, Nebula, ROMs, software manuals and magazines. Only £300. Tel Tadworth 2601.

Vic M/code monitor cartridge £18. Doctor Watsons Assembler book and tape £9. Post paid. Swap Pirates Cove for any other adventure cartridge. Tel Ilfracombe 0271-65589.

Oric-1 software, adventures, Waydor, Franklins Tomb etc, Arcade Defence Force, Digger etc, Strategy, Johnny REB etc. Swap for other Oric software. Tel Slough 79180 anytime.

Vic 20 plus cassette deck, 3K RAM Expansion, Toolkit, MC monitor, joystick. Wide variety of programs, including cartridges. Programming books. £150 ono. Tel Fleet 20587.

Wanted disk drive and 80 column card (ITT 2020) also BBC utilities and software on disk. Tel Mark, Deal (Kent) 0304-374990.

Texas TI99/4A inc speech synthesizer, extended Basic, mini memory, Parsec, Munchman and Invaders and other software. £180 excl delivery. Tel 064-73 3392 (Chagford, Devon).

Atari 800, 48K, cassette, Basic, manuals, 22 month guarantee. Immaculate condition, magazines, Quickshot joystick, over 50 games, Chess cartridge. £300. Tel Mike, 01-777 8867.

ZX81 16K computer with 9 cassettes inc Hi-res tape, manual, leads, books, etc. £55 ono. Tel 0292-43294.

Epson HX20 for sale, good condition. Manuals, micro cassette, leads, etc for sale also. Tel Watersmeet 719 after 6pm. Ask for Angus

Microtan 65 + Tanex + Tanram with 40K + TUG PGN board, keyboard with numeric keypad. No sensible offer refused, or swap MK2 Spectrum. Tel Brian, 0908-641722

Texas TI99/4A, with expansion system 32K RAM TT Logo, Invaders, Munchman six months old, half current prices, £200, could split. Tel 0376-24841 (Essex)

Edutape for Spectrum (48K). Educational maths programs, four of them only for £5. A. Ferguson, Oakdene, Turpins Lane, Frinton, Essex CO13 0PB

TRS80 Model 1, 48K + expansion interface and Tandy monitor, twin disks, printer, NewDOS 80. Lots of software, books and mags. £850 ono. Tel Gosport 20204

48K Spectrum with Interface 1 and Microdrive for sale. All manuals included, and cartridges and software, £250 ono. All good condition. Tel 0602-231265

Oric 48K Dinky Kong arcade game for sale, £5. Tel David, 0702-553849 after 5pm

Commodore tape recorder, Hovver Bover, Scramble Super Gridder, Krazy Kong, £30 the lot. Tel Derek, 01-953 2050 ext 212 from 9th Jan 1984.

Atari cassette software to swap or sell. Tel Haydn at Newent 821793 after 4pm.

Atom 28K RAM. 28K ROM, Acornsoft Wordpro RAM. All on Xpander board. Colour board. 3A PSU. All boxed. Printer O/P offers. Tel 061-865 5809 anytime.

Swap BBC software. Write to Antony Jackson, 5 Denbigh Avenue, Cleveleys, Nr. Blackpool, Lancs FY5 3PT. Please, no personal callers, letters only!

Vic 20 machine code monitor, £18. Also games, Character Generator books (programmers reference guide, etc). Tel 061-653 0246.

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NEXT WEEK

Two on one *A double-header hardware Pro-Test, with features on Olivetti's M10 and Commodore's portable 64.*

Sparks fly *Acorn gets its name in print with the Sparkjet printer.*

In the lab PCN *reviews A-level chemistry packages for the Spectrum — Dr Jekyll and Uncle Clive?*

Electron II *Part two of the pull-out guide to the still elusive Acorn Electron.*

Cash in *Or how to make money from your hobby with a micro. Plus our regular games reviews, software buyer's guide and the week's micro news.*

SUNTAX ERRORS

Commodore costings

BC Basic, the extended Basic for the Commodore 64, costs £19.95 (cassette) and £22.95 (disk), not £15 as stated in our review in Issue 41. The product will be available on cartridge by mid-January. To retail at £45 it will include even more features including procedures, function key definitions and sprite handling. Contact Kuma Computers on (073 57) 4335 for more details.

Off-colour BBC

Higher resolution for BBC 8 Colours in Microwaves, Issue 42 had a problem in that it wasn't. The program listing should have been:

```
10MODE 0
20REPEAT
30FOR 1%=0 TO 7
40VDU 19,0,1%;0;
50NEXT
60*FX19
70UNTIL FALSE
```

Lynx Screen Inks Green, on the same page, was also off-colour. The fourth paragraph should have begun:

Then add OUT082,20 I$=GET$ and RUN

Commodore check

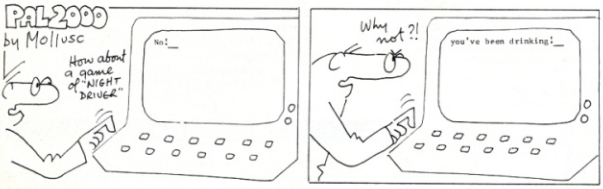
Vizawrite (Issue 40) on the Commodore 64 doesn't work properly with the Commodore 1526 printer so if you're thinking about buying the package, check first that it will drive your printer. Viza Software is at 9 Mansion Row, Brompton, Gillingham, Kent ME7 5SE.

Newbrain puzzler

Printing problems meant that a correction to the Newbrain word processor series published in Issue 42 was incorrect.

The second line of text on page 27 of Issue 39 should read:

Sp$(2)="HXYZ[\]^'a0B5C". Note that there should be no space after the square brackets.



PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

UK EVENTS

Event	Dates	Venue	Organisers
Which Computer? Show	January 17-20	NEC, Birmingham	Clapp & Poliak Europe Ltd., 01-747 3131
Northern Home Entertainment Show	January 19-22	Excelsior Hotel, Manchester Airport	Stamley Wire Advertising Ltd., 01-253 6637
Acorn Education Exhibition	January 25-27	Central Hall, Westminster	Computer Marketplace (Exhibitions) Ltd, 01-930 1612
Peripherals Suppliers	January 31-February 2	Cunard International	Reed Exhibitions, 01-643 8040
Communications & Computer Systems Fair — CABLES	February 2-4	Pontin's, Prestatyn, Wales	Pontin's Ltd., 07456 2267
London Home Computer Show	February 3-5	Royal Horticultural Society's Old Hall, Westminster, SW1	Andy Jones, 0562 751126
10th ZX Microfair	February 4	Alexandra Palace, N22	Mike Johnston, 801 9172
The Apricot & Sirius Show	February 7-9	Kensington & Chelsea Town Hall	Dennis Jarrett, 241 2448
Taunton YMCA Computer Exhibition	February 11	Taunton YMCA, Somerset	P. Wojcik, 0823 74667
LET '84	February 13-15	Heathrow Penta Hotel	Anthony Farrar, 0923 774262
International Home Computers, Video Games & Software Exhibition	February 13-15	Heathrow Penta	Wheatland Journals Ltd., 0923 774262
Information Technology & Office Automation Exhibition and Conference	February 21-24	Barbican Centre, London EC1	B.E.D. Exhibitions Ltd., 01-647 1001
OEM Only Conference	March 7	Hilton Hotel, London W1	Tom Lewis, 01-994 6477
Computer Trade Show	March 13-15	Wembley Conference Centre, Middlesex	Reed Exhibitions, 01-643 8040

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
International Winter Consumer Electronics Show 22-25	January 6-10	Las Vegas, USA	Consumer Electronics Shows, Chicago, 0101 312 861 1040
National Software Show (East)	February 3-5	Miami Beach, Florida, USA	Raging Bull, USA, 0101 415 459063
Personal Business Computer Show	February 29-March 3	Hong Kong	Overseas Exhibition Services Ltd., 01-486 1951

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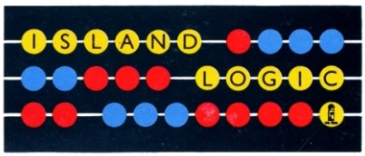
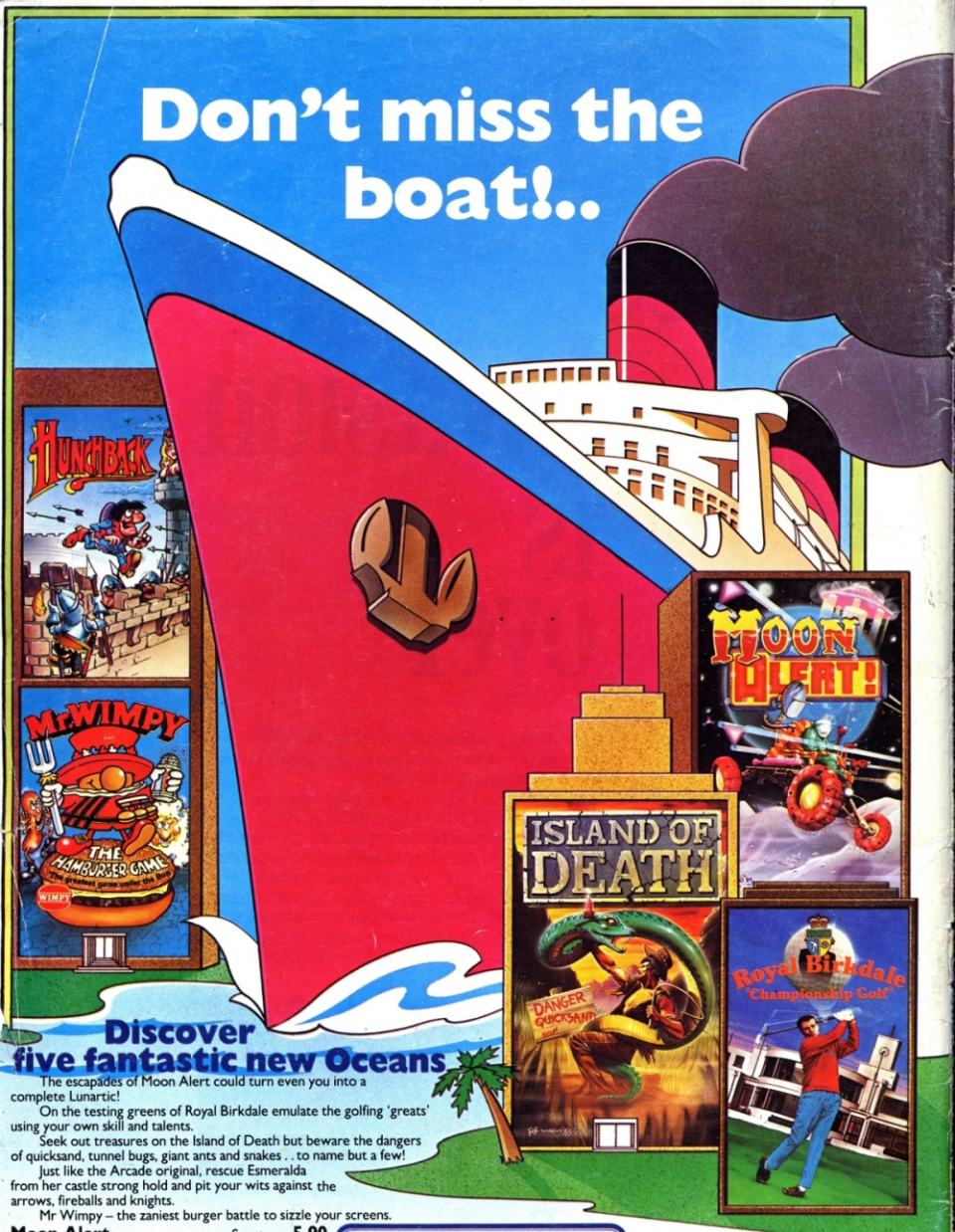


ENTERTAINING INTELLIGENCE

Don't miss the boat!..



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